MUTLI-STAGE SEAWATER (MSS) HIGH PRESSURE PUMPS

Installation, Operation, Maintenance & Service Manual

Models: MSS-15 ● MSS-20 ● MSS-30 ● MSS-40 ● MSS-50 ● MSS-55 ● MSS-70 ● MSS-75

Register the product warranty at the time of installation by completing the Warranty Registration Form at the rear of this manual and fax or e-mail it to FEDCO.

Warranty Registration should be sent to:

ATTN: Field Service Department
FEDCO
800 Ternes Drive
Monroe, MI 48162
USA

Additional Contact Information:
Tel 734-241-3935
Fax 734-241-5173
Web site: www.fedco-usa.com
Choose the "Service and Support" tab

! IMPORTANT: FOR REASONS OF SAFETY AND MAINTENANCE, ONE COPY OF THIS MANUAL MUST REMAIN WITH THE EQUIPMENT AT ALL TIMES.

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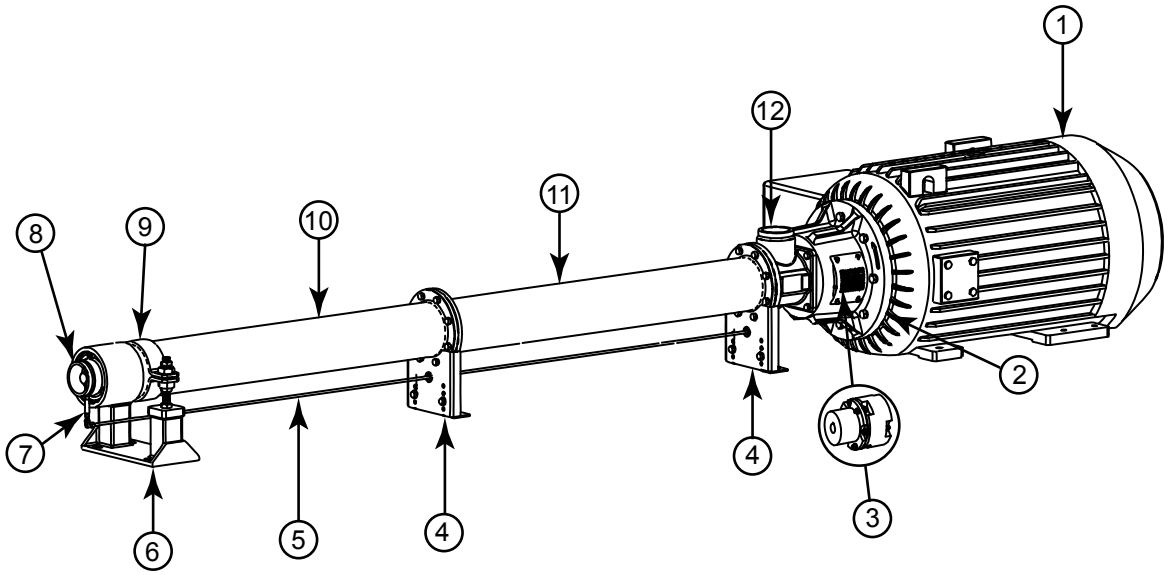
Theory and Operation

MSS Pump External Components

Multi-stage seawater (MSS) pumps are centrifugal feed pumps specifically designed for seawater reverse osmosis (SWRO) service. MSS pumps develop pressure by using a series of impellers mounted on a rotating shaft. Rotating this fluid through centrifugal force develops a pressure higher than was input. Pressure can be increased through the addition of impeller stages or by increasing shaft rpm.

Motors are selected according to equipment operating requirements (Figure 1). A flexible coupling allows the pump shaft to float within the coupling eliminating thrust against the motor. The inlet and discharge housing is designed to connect to grooved rigid piping with couplings. The inlet housing itself can be attached to the pump in four different positions 90° apart. A precision leveling foot supports the end shell housing and is fully adjustable to allow accurate pump-to-motor shaft alignment.

Typical MSS-15 through MSS-75 Pump External Components



Item	Description	Item	Description
1	Motor	7	Throttle nipple
2	Motor adapter	8	Discharge housing
3	Flexible coupling (inside of Motor Adapter	9	Top cradle
4	Support bracket	10	End Shell housing
5	Bearing drain line	11	Series Shell housing (if equipped)
6	Precision Leveling Foot	12	Inlet Housing

Figure 1 MSS Pump External Components

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Theory and Operation (cont.)

MSS Pump Internal Components

The internal components of an MSS pump can vary depending on pump configuration and number of stages. The basic components contained in a single stage consist of an impeller and a diffuser with a spacer and bushing which prevent friction and wear.

Behind the discharge housing at the end of the pump is the WATER BEARING™ assembly. (Figure 2). The balance disc rides in the bearing carrier and serves as a thrust bearing for the pump. This unique design uses patented WATER BEARING™ technology which allows feed water to cool and lubricate the balance disc.

As the motor rotates the pump, pressure differences acting on the rotating impellers generate an axial thrust acting toward the motor. The water bearing employs the balance disc to create a counter-pressure which exactly cancels the impeller thrust load. The bearing drain line and throttle nipple are used help produce the counter-pressure on the balance disc. This thrust and counter-thrust allows the disc to "self-balance" based on operating conditions.

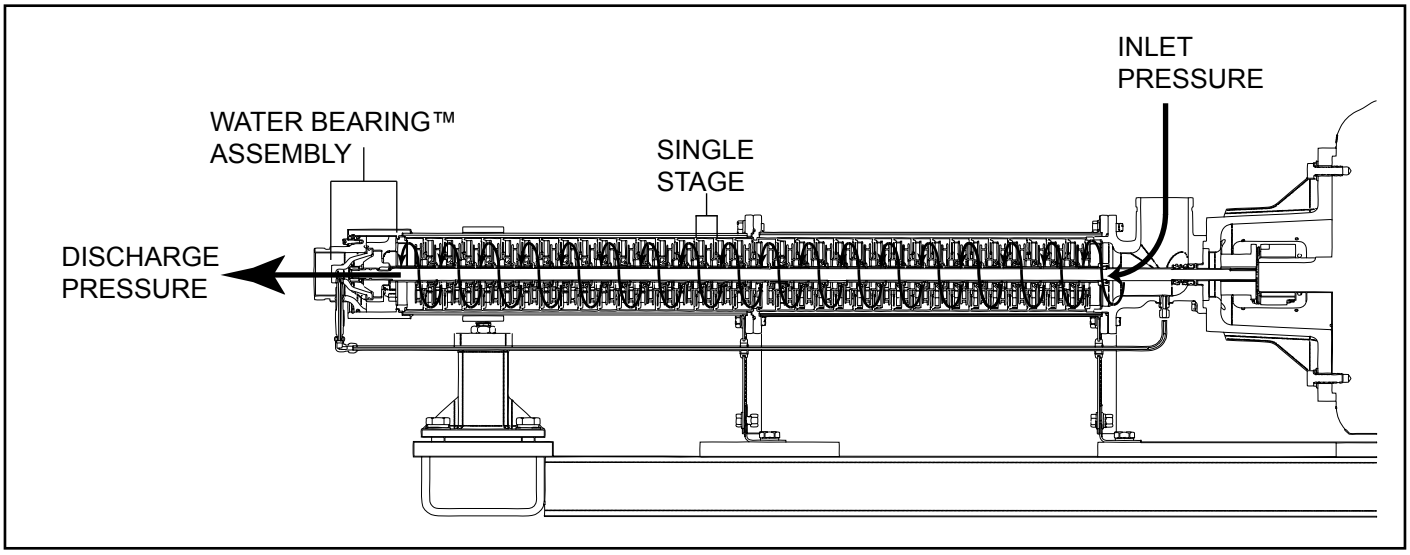

Figure 2 MSS Pump Internal Flow

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Installation Procedures

Warnings and Safety Precautions

Safety practices and precautions for the operation and maintenance of all FEDCO pump products MUST BE FOLLOWED. This information supplements oral or written instructions that may be received. Safety MUST be practiced as part of the standard operating procedures for this equipment during any installation and operation. To ensure that safe operating and maintenance procedures are followed, operators should develop and keep up a program of safety checks and current instructions. This manual contains certain operating and maintenance procedures that involve exposure to potentially hazardous situations. The levels of hazardous situations are as follows:

DANGER

Hazards which are IMMEDIATELY ACCESSIBLE, and capable of causing SEVERE PERSONAL INJURY OR DEATH.

WARNING

Hazards which are NOT IMMEDIATELY ACCESSIBLE, but are capable of causing SEVERE PERSONAL INJURY OR DEATH.

CAUTION

Hazards which are NOT IMMEDIATELY ACCESSIBLE, and can cause PERSONAL INJURY.

ELECTRICAL HAZARD

Hazards which are related to Electrical Components and can RESULT IN ELECTRICAL RISKS, SHOCK, ELECTROCUTION OR DEATH if instructions are not followed properly.

PUNCTURE HAZARD

Hazards which are NOT IMMEDIATELY ACCESSIBLE and can RESULT IN SEVERE PERSONAL INJURY OR DEATH if instructions are not followed properly.

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Installation Procedures (cont.)

WARNING

All pump and safety precautions must be followed to prevent physical injury to the operator. It is illegal to operate the equipment in an EU member state, which requires CE compliance, if the manual is not written in that state's language. If a translation is needed, please contact a FEDCO representative.

CAUTION

A pump is a pressure-generating device with rotating parts that can be hazardous. Any device containing generated pressure can rupture, explode or discharge its contents if it is sufficiently over-pressurized and may possibly result in personal injury, property damage, environmental damage and death. All necessary precautions must be exercised to insure over-pressurization does not occur. FEDCO will not accept responsibility for physical injury, damage or delays caused by a failure to observe the instructions in this manual.

WARNING

Installation, operation or maintenance of the pump unit in any manner which is not covered in this manual could cause damage to the equipment, serious injury or death. This includes any modification to the equipment or the use of parts not provided by FEDCO. If there is a question regarding the intended use of the equipment, please contact a FEDCO representative before proceeding.

CAUTION

This manual clearly identifies accepted methods for safe disassembly. These methods must be strictly adhered to.

WARNING

Do not use the pump equipment for a different application than originally specified without the approval of a FEDCO representative.

WARNING

NEVER operate the pump equipment:

- below the minimum flow rate.
- when dry.
- without priming.
- without proper guards and safety devices installed.
- with the discharge valve closed.
- with the suction valve closed.

ELECTRICAL HAZARD

Always follow the Lock-out / Tag-out procedure developed by your company before starting any maintenance or repair (Figure 3).

Figure 3 Typical Lock-Out Tags

User Health and Safety

Safety Equipment should be used in accordance with company regulations. The following safety equipment should be used within the work area:

- Helmet.
- Safety Glasses with shields or goggles.
- Safety Shoes.
- Protective Gloves.
- Hearing Protection is recommended.
- Follow safe lifting methods to avoid personal injury.

In the Work Area

- Always keep the work area clean and dry.
- Avoid all electrical dangers. Be aware of risks from electric shock or arc flash hazards.
- Utilize adequate lifting equipment and methods.

Electrical Connections and Regulations

- Refer to the motor nameplate for specific electrical operating information (Figure 4).
- Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations and codes.
- Insure the product is isolated from the power supply and cannot be accidentally energized.
- Make sure all thermal contacts are connected to a protection circuit according to product specifications.
- All electrical equipment must be properly grounded (Figure 5).
- During installation, service and repair, must always follow your company's Lock-out / Tag-out procedure.

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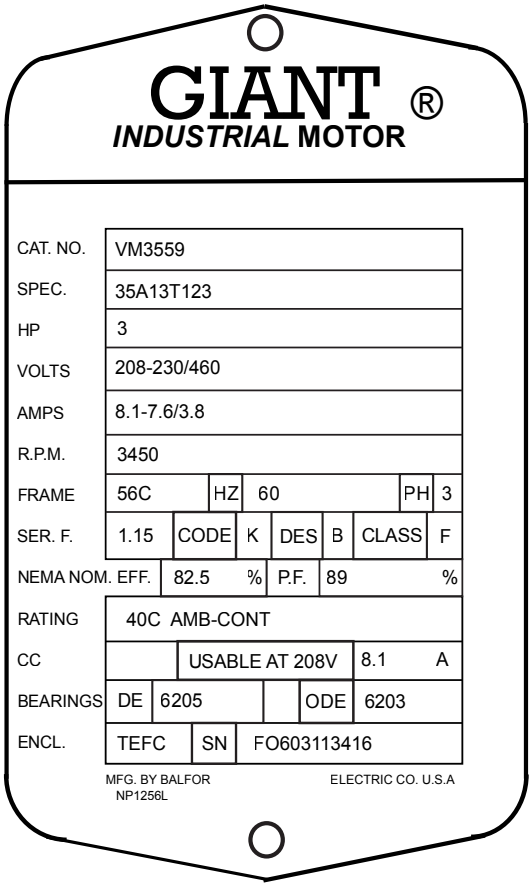

Figure 4 Typical Motor Nameplate

Motor Requirements

ELECTRICAL HAZARD

Wiring of the motor shall be completed in conformance with all local electrical codes. All EU countries must follow EN 60204-1. If a variable frequency drive (VFD) is provided with the motor, it is recommended that shielded cables are used between the VFD and the motor. The shield must be connected at both ends.

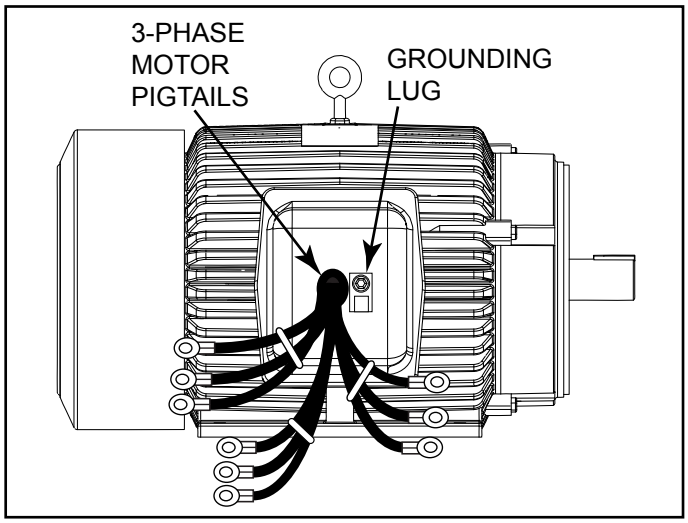

Figure 5 Typical Motor Electrical Connections

Installation Procedures (cont.)

Variable Frequency Drive (VFD) Requirements

If a VFD is used, it must be configured to match the motor nameplate information. The VFD does not come preprogramed (Figure 6). Please contact the equipment supplier if the VFD programming manual is not available. Important note for CE compliant countries: the VFD must have a line filter which must be installed in the same metallic enclosure as the drive.

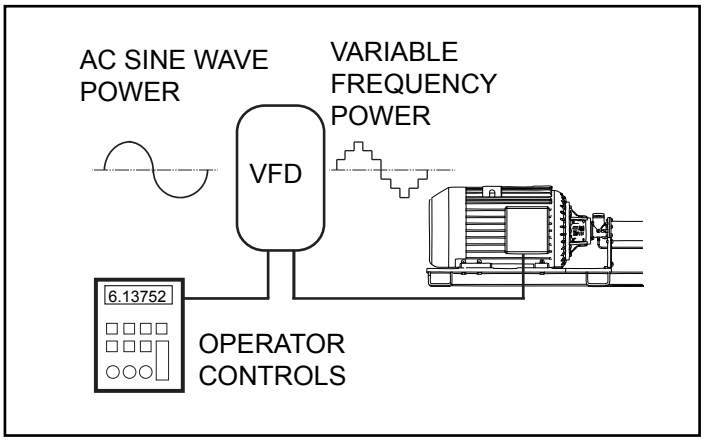

Figure 6 Basic VFD Configuration

Motor and Pump Installation Requirements

A rigid mounting surface is required for pump-motor assemblies in order to prolong the life of critical components. Mounting surfaces constructed of wood or other non-rigid materials are NOT acceptable as they may deflect during pump operation and cause shaft misalignment. All anchoring fasteners used should meet or exceed manufacturers specifications. All assemblies must be mounted on one of three types of substrates:

- concrete foundation.
- optional baseplate.
- container with a suitable steel substructure.

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Installation Procedures (cont.)

Inspection of Unit Upon Receipt

- Review the contents of the packing list to make sure all components have been included.
- Inspect all components for signs of damage which may have occurred during shipping.
- If damage is present or if the contents are incomplete, please contact your shipping company or a FEDCO representative before proceeding.

Pump Storage Requirements

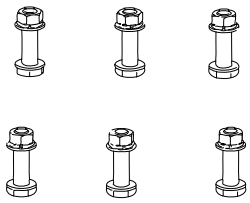
The MSS pump must be protected from sand, grit, and other foreign matter. Do not remove the protective covers from the pipe connections until ready to install. For long-term storage, keep pump and all other components in its original crate away from sand or dust.

Motor Storage Requirements

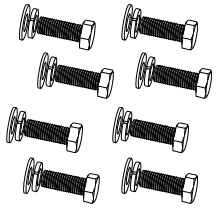
Specific conditions are required for proper motor care and storage. Refer to the motor manufacturers instructions for specific steps and instructions.

Pre-Installation

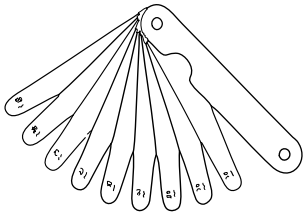
In most instances, the pump and motor are shipped in separate crates. The pump crate also contains the flexible coupling and accessories necessary for the pump-motor installation. The flexible coupling is pre-assembled and should not be disassembled. All installation accessories required can be found in either crate (Figure 7).



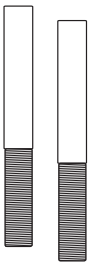
4 to 6 Motor mounting bolts with washers and nuts (if motor and baseplate is provided by FEDCO)



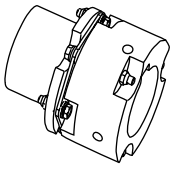
4 to 8 Motor adapter bolts with washers



Feeler Guages

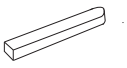


2 Alignment Pins



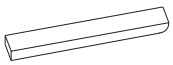
Flexible coupling

2 Flexible coupling set screws



Pump shaft key

Anit-seize compound



Motor shaft key (if motor is provided by FEDCO)

Figure 7 Installation Accessories

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Installation Procedures (cont.)

Lifting and Handling

CAUTION

Observe all lifting precautions. Failure to follow all lifting and handling precautions may result in serious injury! Unit weight is listed on the unit nameplate. Determine the weight of the unit to select an appropriate lifting method. If the weight of the pump exceeds manual lifting limits, mechanical lifting equipment must be used. MSS pumps can be lifted by the shell using approved lifting straps together with suitable lifting equipment. The straps must be installed around the shell without disturbing the drain line (Figure 9). If straps are placed around the drain line, damage can occur (Figure 8).

Pump Assembly Lifting

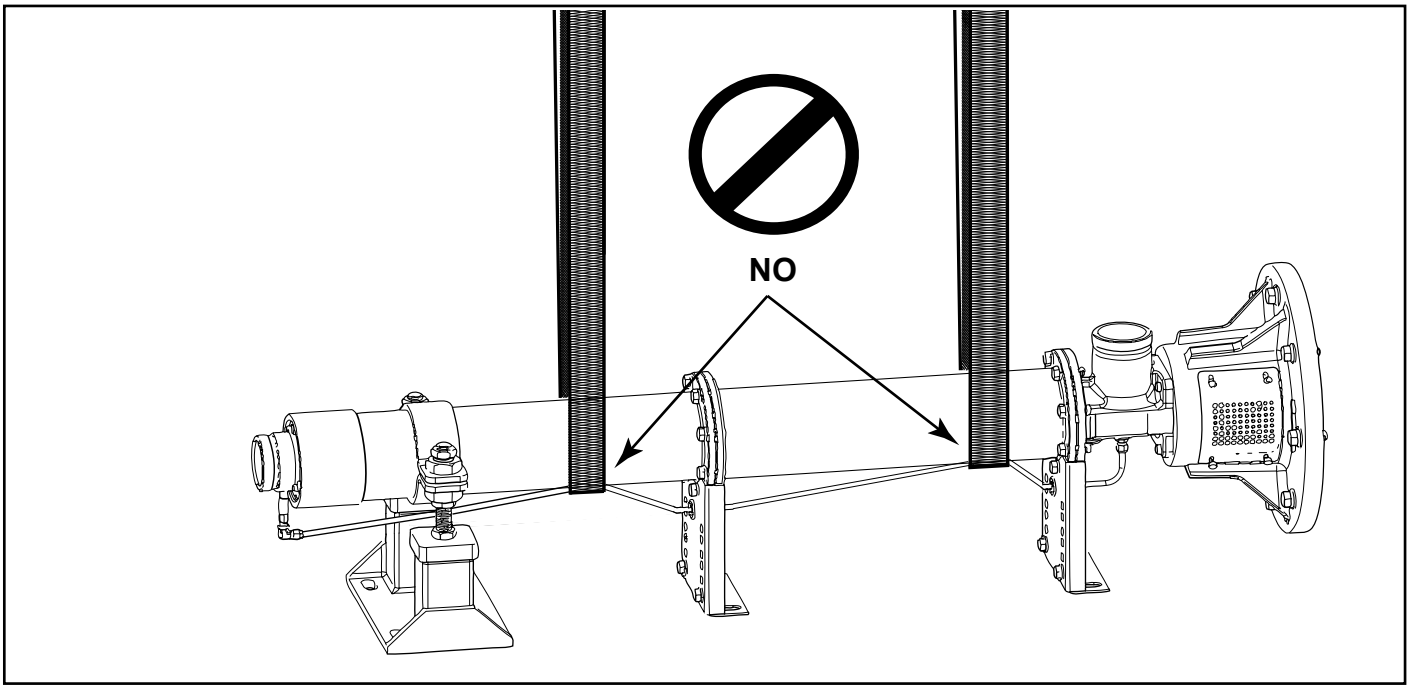

Figure 8 Improper Lifting Strap Positioning

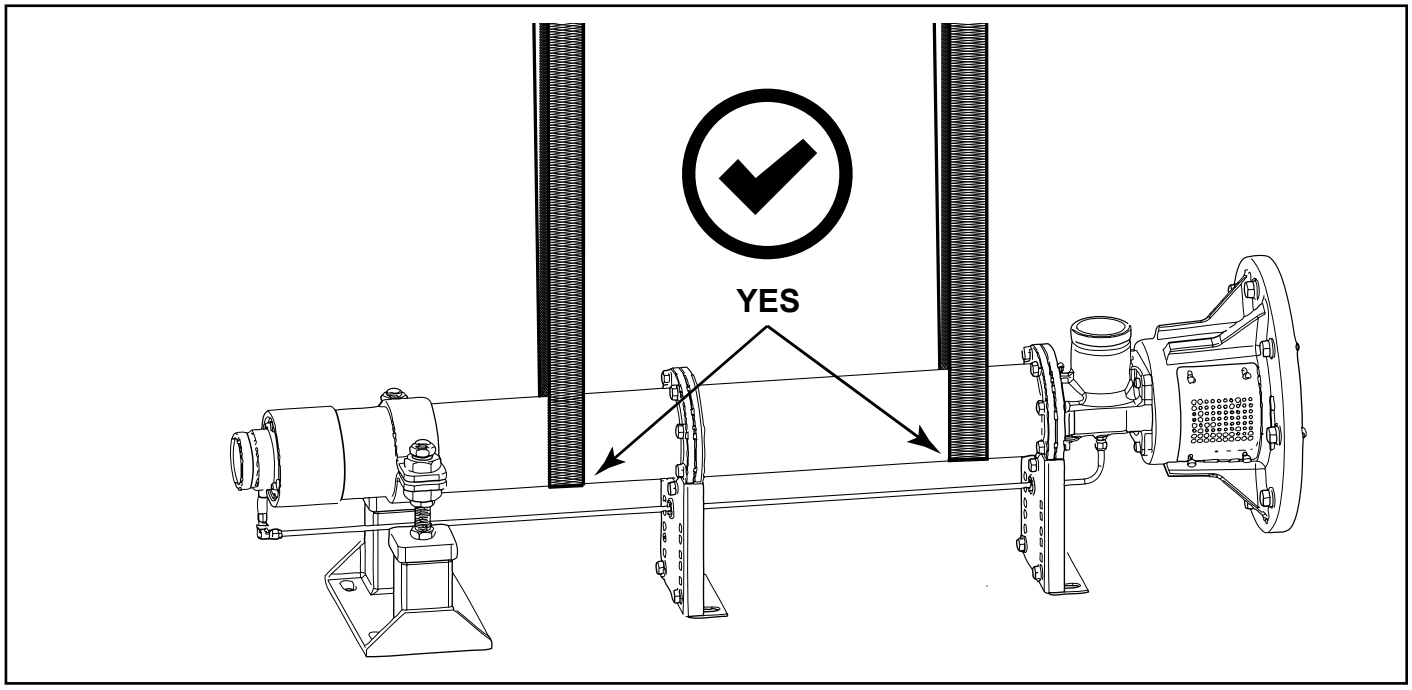

Figure 9 Proper Lifting Strap Positioning

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Installation Procedures (cont.)

CAUTION

Whenever possible, all component should be lifted and moved separately for safety. Do not lift the pump up by the shaft. If the unit is lifted by the shaft, damage may occur. Lifting and handling of the motor must be performed according manufacturers instructions. **Do not lift the pump and motor by the motor eyebolt** (Figure 10). The eyebolt is used for lifting the motor only.

Motor and Pump Assembly Lifting

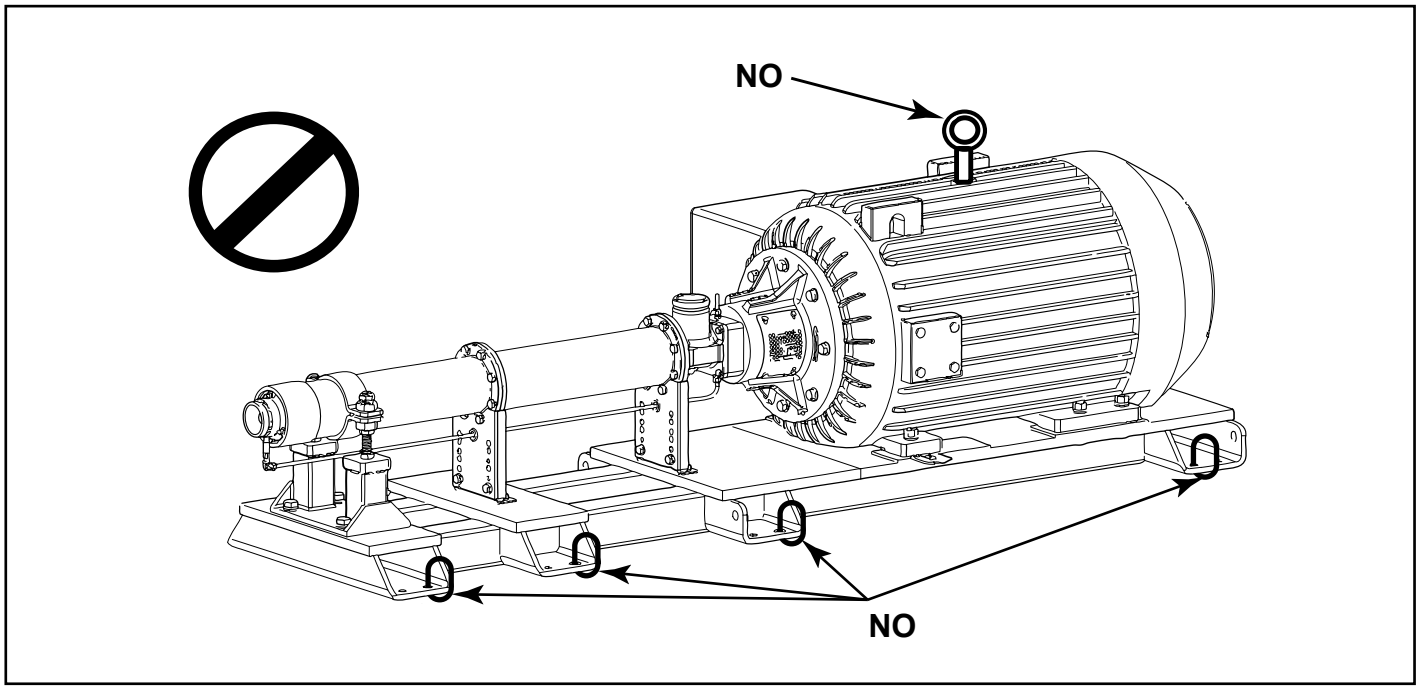

Figure 10 Improper Motor and Pump Lifting Points

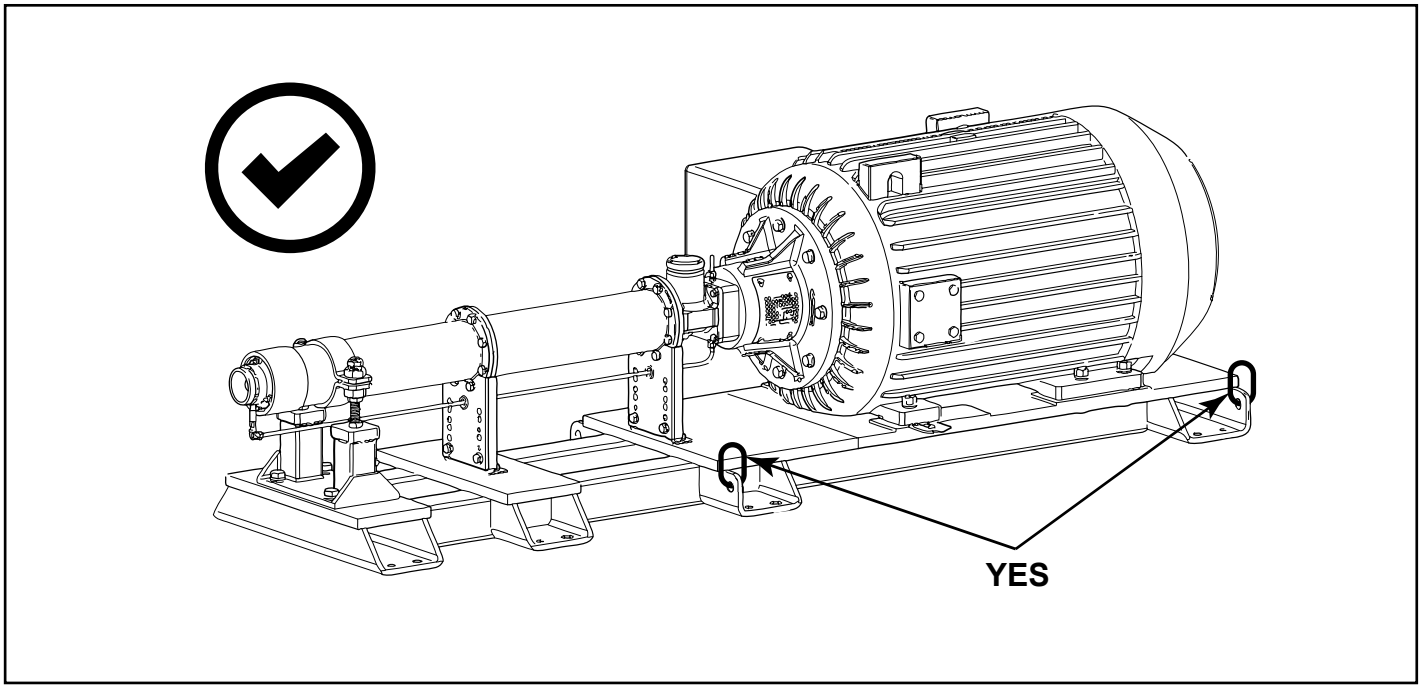

Figure 11 Proper Motor and Pump Lifting

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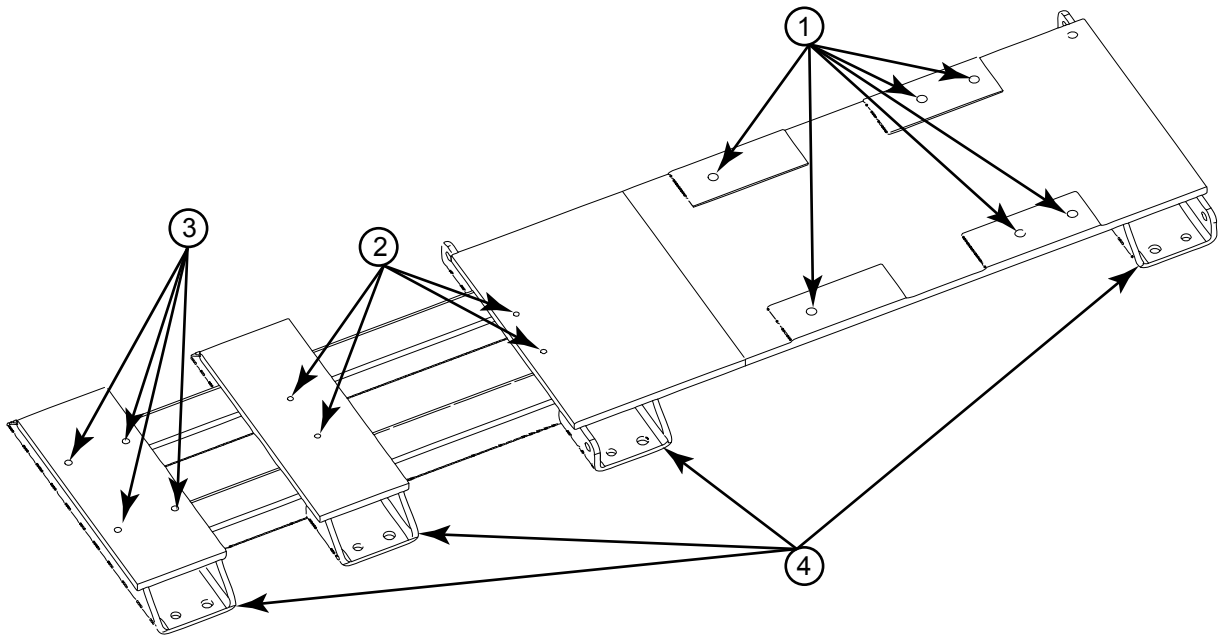
Installation Procedures (cont.)

Optional Baseplate Installation

Some units include an optional FEDCO baseplate which provides good mounting surfaces for the motor and pump (Figure 12). It also increases accuracy during the alignment process. Although the baseplate is precisely manufactured, it requires a solid foundation such as a concrete pad or rigid steel substructure. If the optional baseplate is used, it must be installed first to avoid distortion which may occur due to uneven floors or substructure (Figure 13). If the pump is installed within a container, it must be mounted on a rigid steel substructure that will not distort under the weight of the equipment or from torque reaction forces during pump operation.



Item	Descripttion	Item	Description
1	Motor mounting (4 to 6 depending on motor)	3	Precision leveling foot mounting
2	Support bracket mounting	4	Baseplate mounting feet

Figure 12 Optional Baseplate

Foundation Specifications

A concrete foundation is recommended for all MSS pump installations. Concrete provides good support and good vibration absorption. The foundation should have a mass that is 50% more than the total weight of the equipment and its perimeter should extend at least 6 inches (15 cm) on each side from the pump and motor. Make sure the concrete is completely dry and level before installing any machinery. Make sure anchor bolts and shims are properly sized and installed in cases of uneven surfaces (Figure 13).

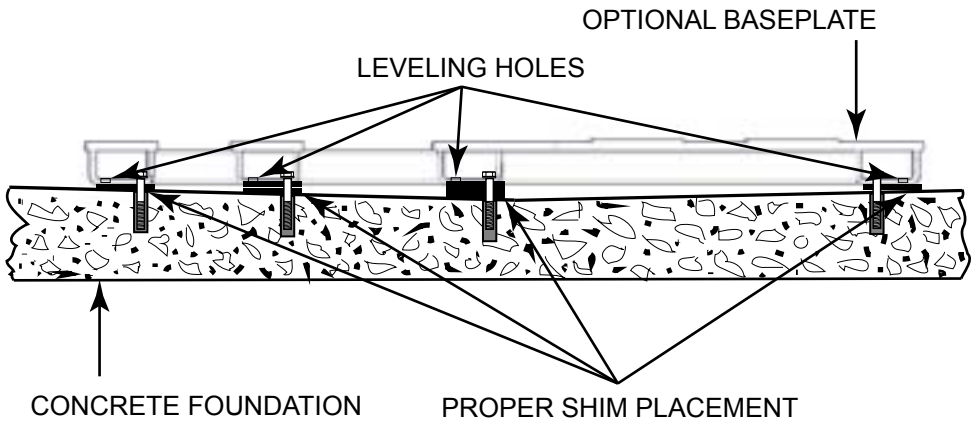


Figure 13 Proper Shimming

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Installation Procedures (cont.)

Motor Installation

1. Clean the motor flange face with a clean cloth to remove any foreign matter, rust or protective coating and place the motor in its mounting position. (Figure 14).

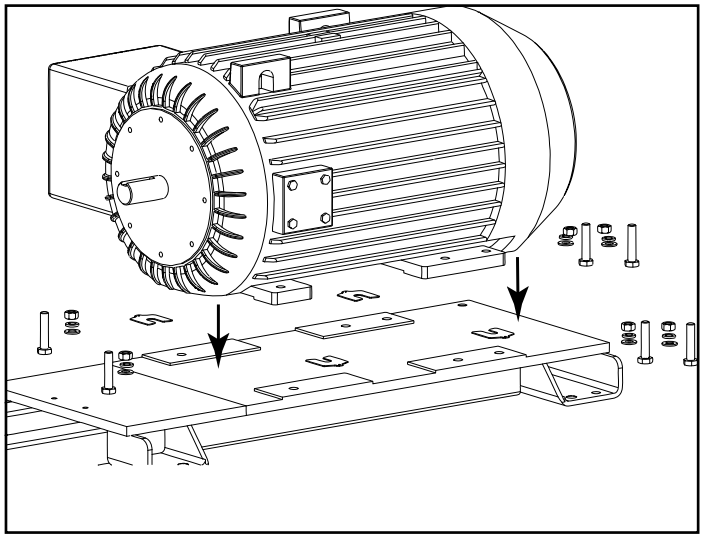

Figure 14 Placing Motor in Mounting Position

2. Install the motor mounting bolts and shims as necessary (Figure 15). Tighten to motor manufacturers specifications.

NOTE: Make sure to install shims where necessary to prevent motor frame distortion resulting from "soft-foot." Soft-foot is a condition were one of the motor frame feet are not in flat contact with the mounting base. If not properly shimmed when the bolt is tightened, the motor frame will distort.

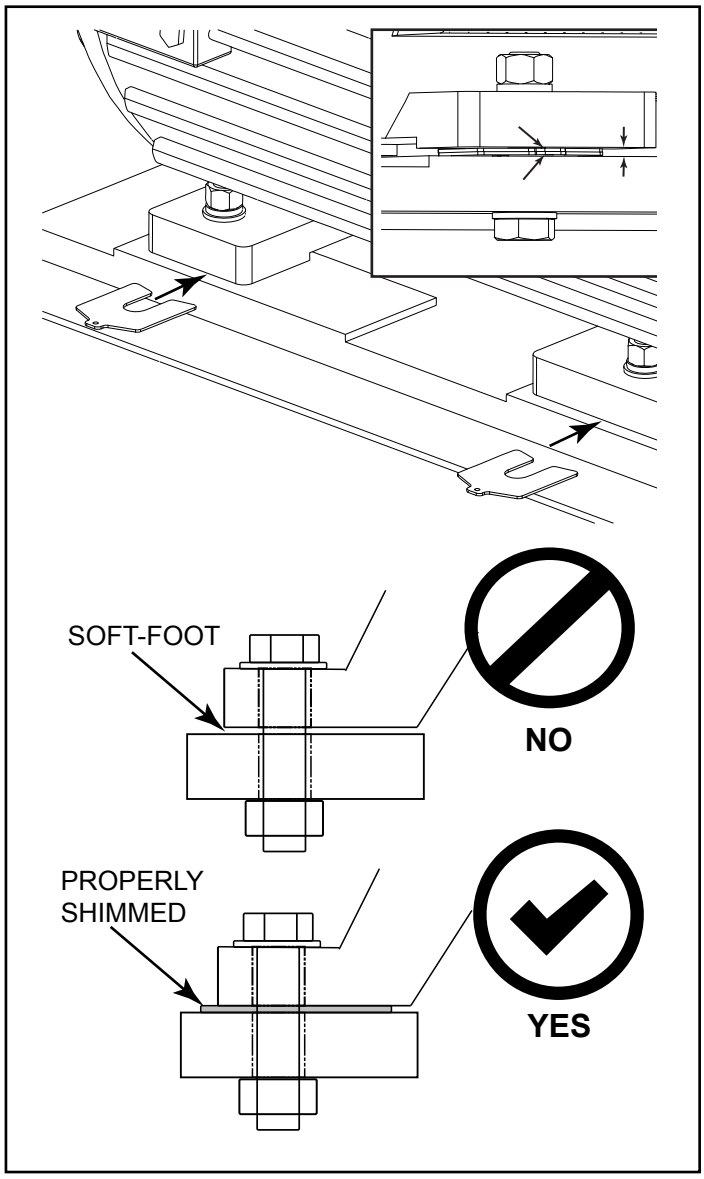

Figure 15 Installing Motor Mounting Shims

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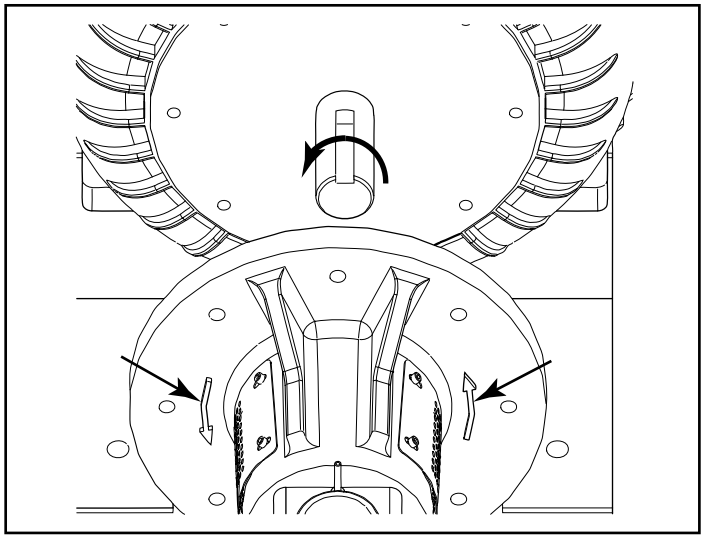

Figure 16 Directional Arrows on Motor Adapter

Installation Procedures (cont.)

Motor Rotational Direction Check

3. Prior to pump installation, energize the motor to determine direction of rotation. The correct rotation is indicated by arrows on the motor adapter (Figure 16). If the rotation is incorrect, reverse the polarity of the motor wiring to change the direction of rotation.

   NOTE: Reversing the polarity of the VFD power input wires will not change the motor rotational direction.

4. If the motor rotational direction is correct, disconnect power to the motor according to lock-out/tag-out procedures and complete all electrical connections according to local codes and regulations.

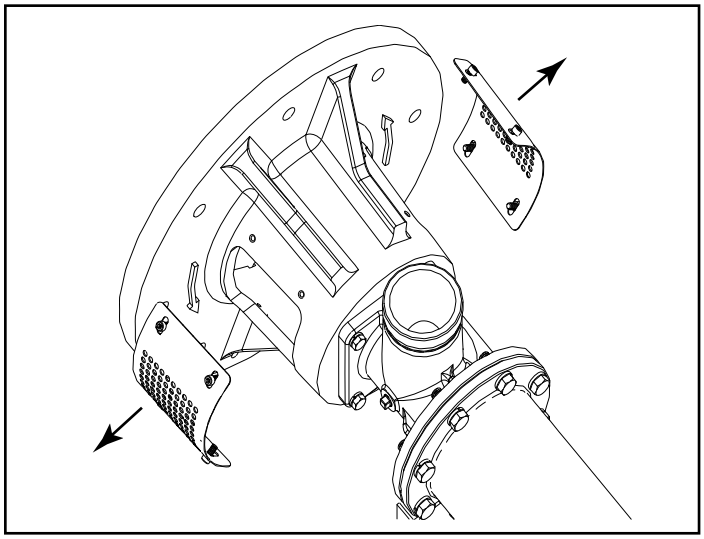

Figure 17 Removing Coupling Guards

5. Loosen eight (8) screws and remove the coupling guards (Figure 17).

Flexible Coupling Check

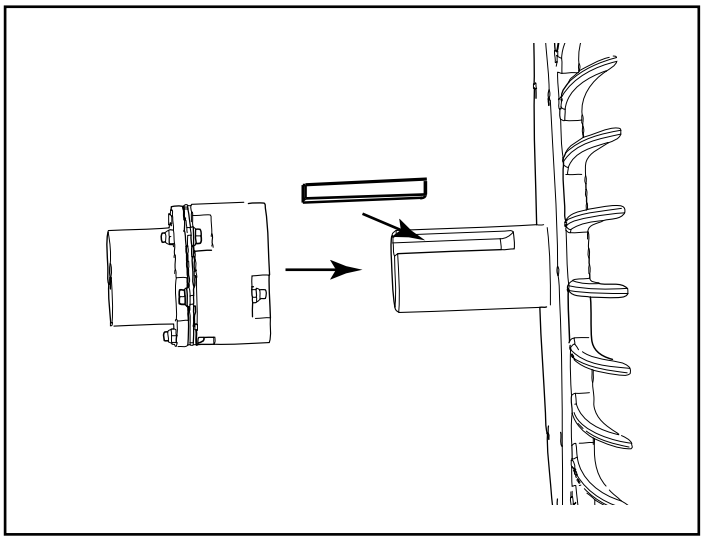

Figure 18 Installing Flexible Coupling on Motor Shaft

6. Slide the flexible coupling over the motor shaft with the motor shaft key (Figure 18).

   NOTE: If the motor shaft key does not fit properly in the coupling keyway, lightly file the motor shaft key until a proper fit is obtained.

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Installation Procedures (cont.)

7. Inspect the flexible coupling radial and axial fit. It should be tight with no visible radial movement and slide smoothly on and off the motor shaft (Figure 19).

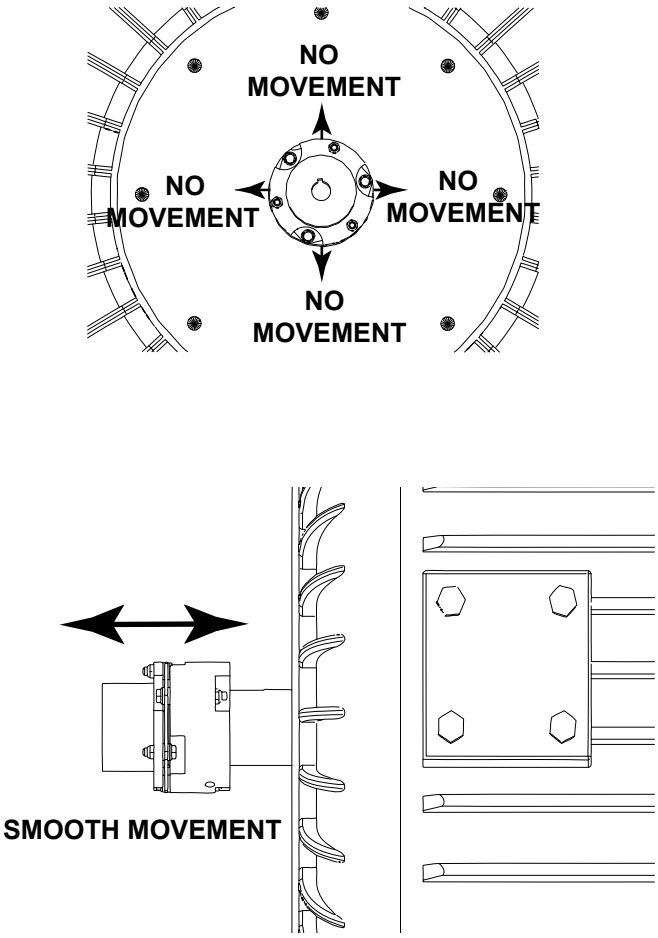

Figure 19 Checking Flexible Coupling Fit on Motor Shaft

8. Slide the flexible coupling over the pump shaft with the pump shaft key (Figure 20).

   NOTE: The rounded end of the key must be placed in the rounded end of the keyway.

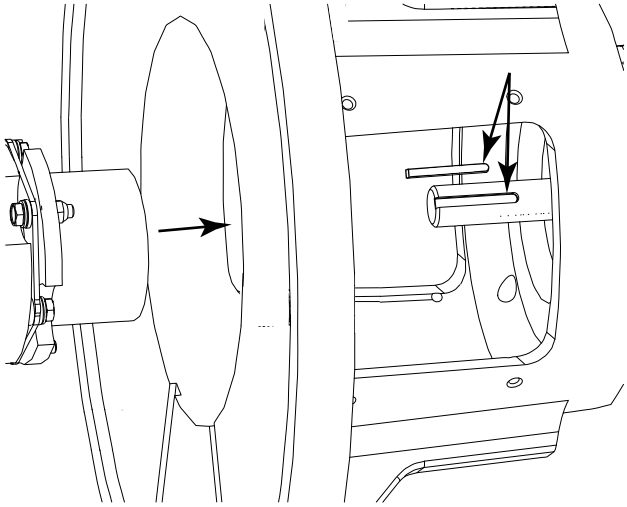

Figure 20 Installing Flexible Coupling on Pump Shaft

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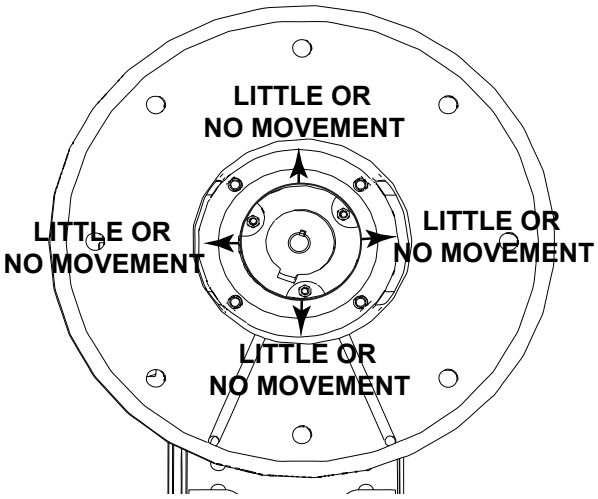

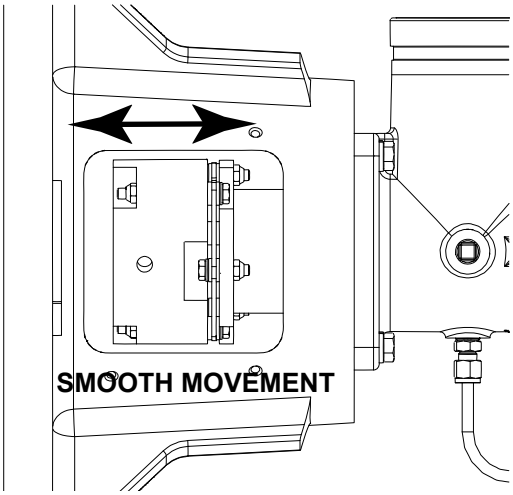

Figure 21 Checking Flexible Coupling Fit on Pump Shaft

Installation Procedures (cont.)

9. Inspect the flexible coupling radial and axial fit. It should have little or no movement and be slightly looser than the motor shaft fit. It should also slide smoothly on and off the pump shaft (Figure 21).

10. Once proper flexible coupling fit on both shafts has been obtained, remove the flexible coupling and proceed with Initial Pump Alignment.

    NOTE: The flexible coupling will not be needed until Final Pump Alignment procedure.

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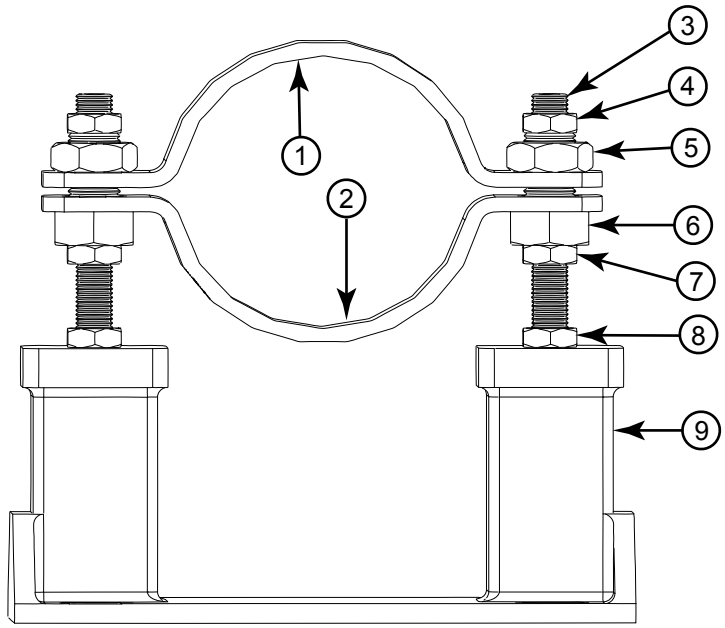
Installation Procedures (cont.)



Item	Description
1	Top cradle
2	Bottom cradle
3	Threaded rod
4	Jam nut
5	Top nut
6	Threaded rod nut
7	Adjustment nut
8	Jam nut
9	Leveling foot frame

Figure 22 Precision Leveling Foot Components

Initial Pump Alignment

11. Remove the four (4) nuts and the top cradle from the precision leveling foot (Figure 23).

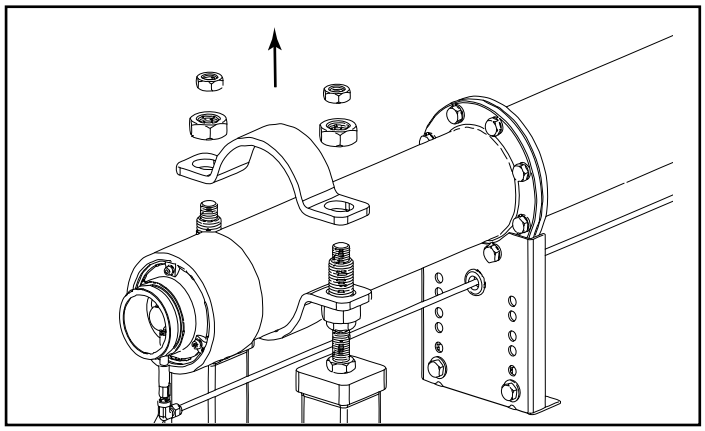


Figure 23 Removing Top Cradle

12. Install the two (2) alignment pins 180° apart into the motor face Figure 24).

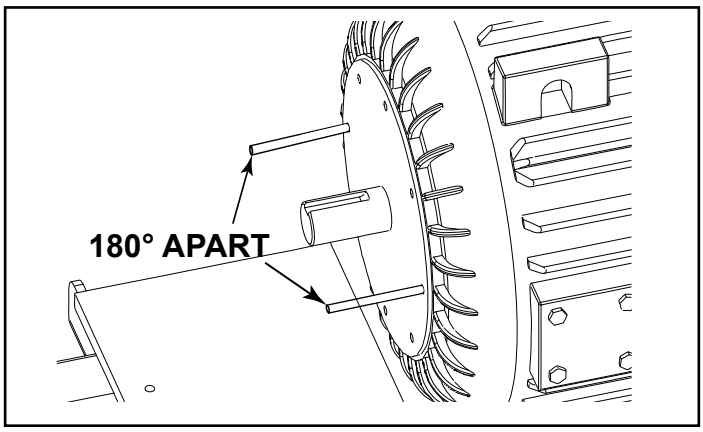


Figure 24 Alignment Pin Installation

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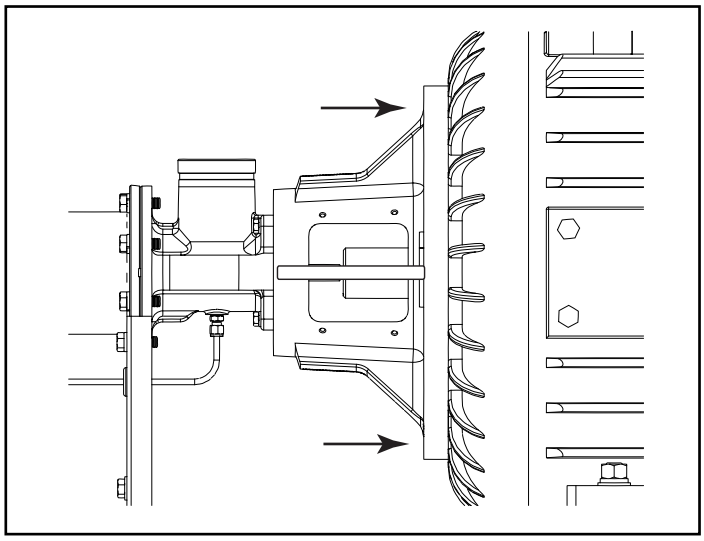

Figure 25 Positioning Pump onto Alignment Pins

Installation Procedures (cont.)

13. Carefully slide the pump onto the alignment pins and as close to the motor face as possible (Figure 25).

    NOTE: Depending on the motor manufacturer, a small gap may or may not be visible between the motor face and the motor adapter

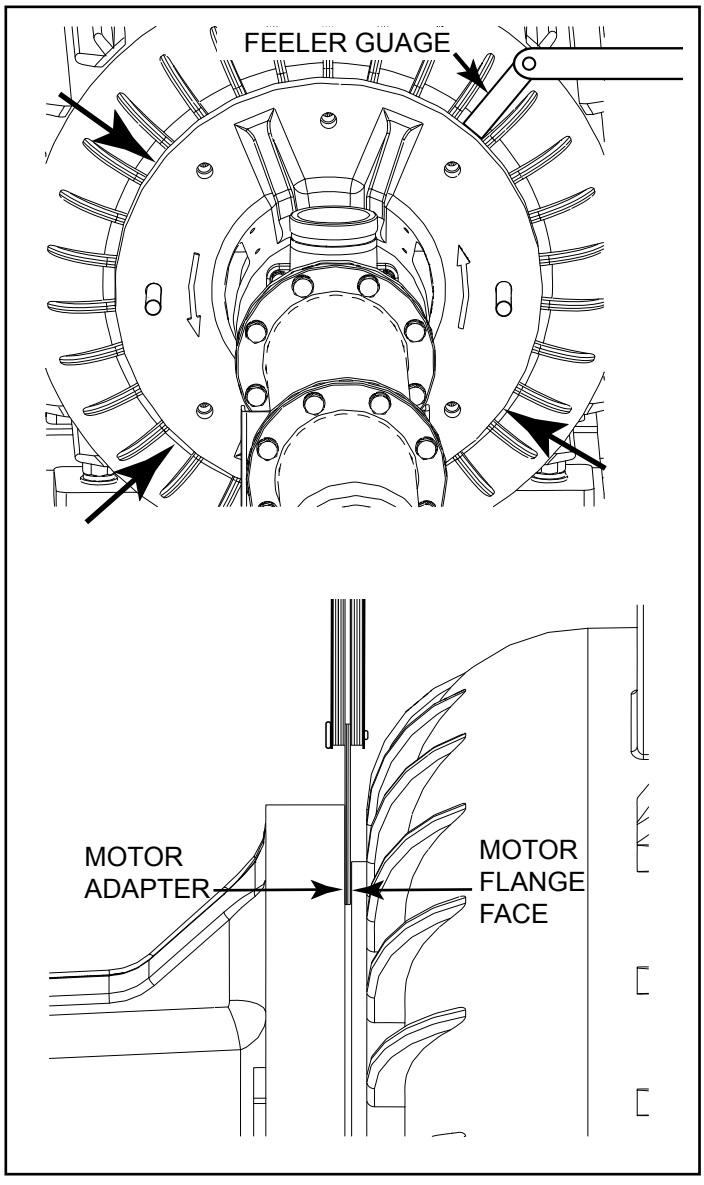

Figure 26 Motor Adapter Gap Measurement Points

14. If a gap exists between the motor adapter and motor, use the feeler gauges (provided) to measure the gap at 4 different points 90° apart (Figure 26).

    NOTE: In some instances, there may be no gap between the motor and motor adapter.

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Installation Procedures (cont.)

15. Align pump by adjusting the precision leveling foot:

    A. ADJUST TOP AND BOTTOM GAP - by rotating the adjustment nuts (Figure 27).

    B. ADJUST RIGHT SIDE AND LEFT SIDE GAP -

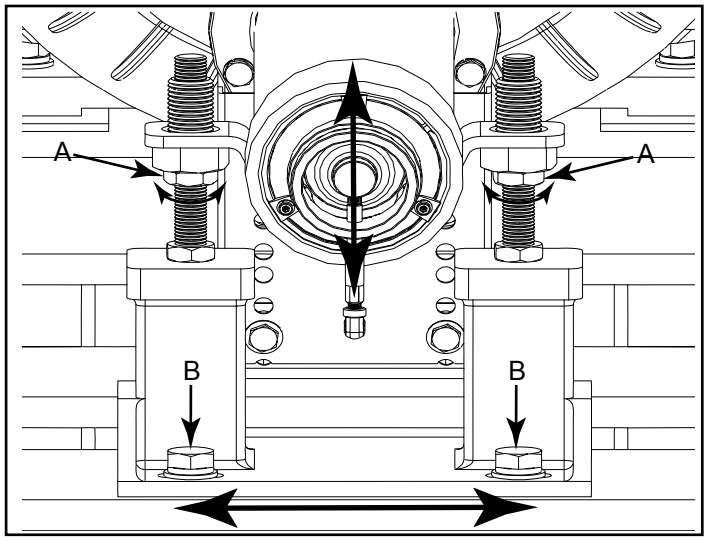

Figure 27 Precision Leveling Foot Adjustment

16. Measure the motor adapter gap and continue adjustment until the gap between the motor adapter and the motor is the same at the top and bottom (Figure 28).

    NOTE: This step is critical in properly aligning the pump with the motor. All four measurements must be the same to ensure proper pump-to-motor shaft alignment.

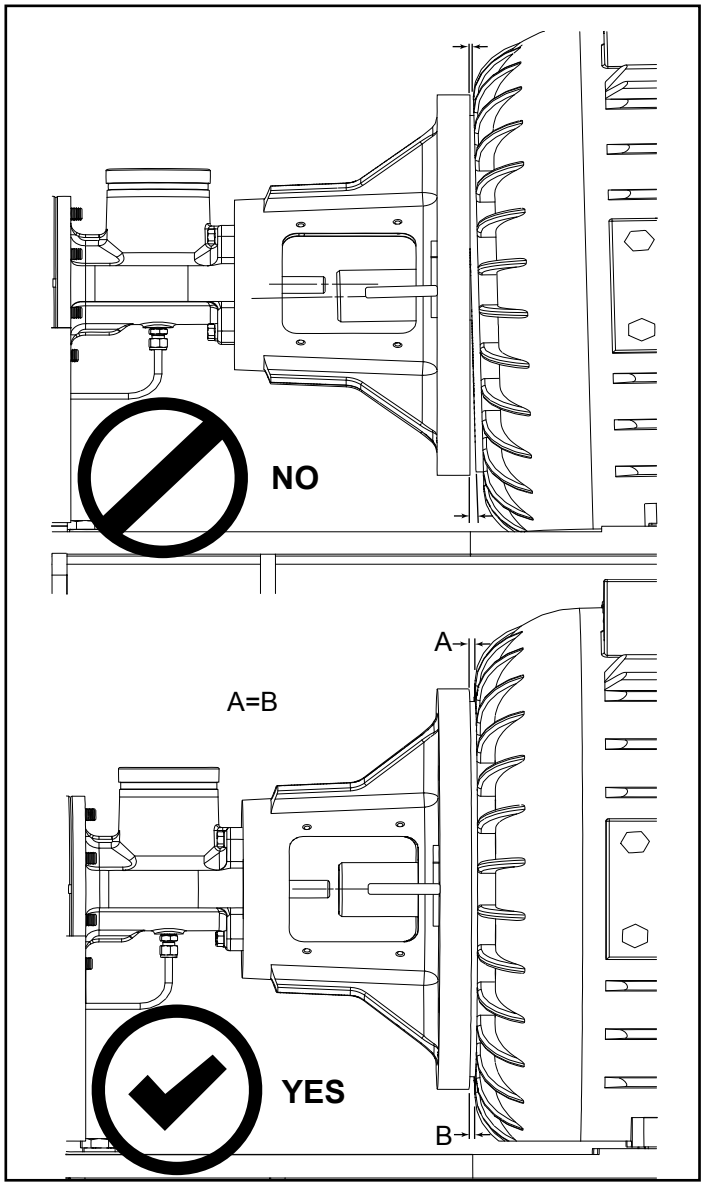

Figure 28 Proper Top and Bottom Gap

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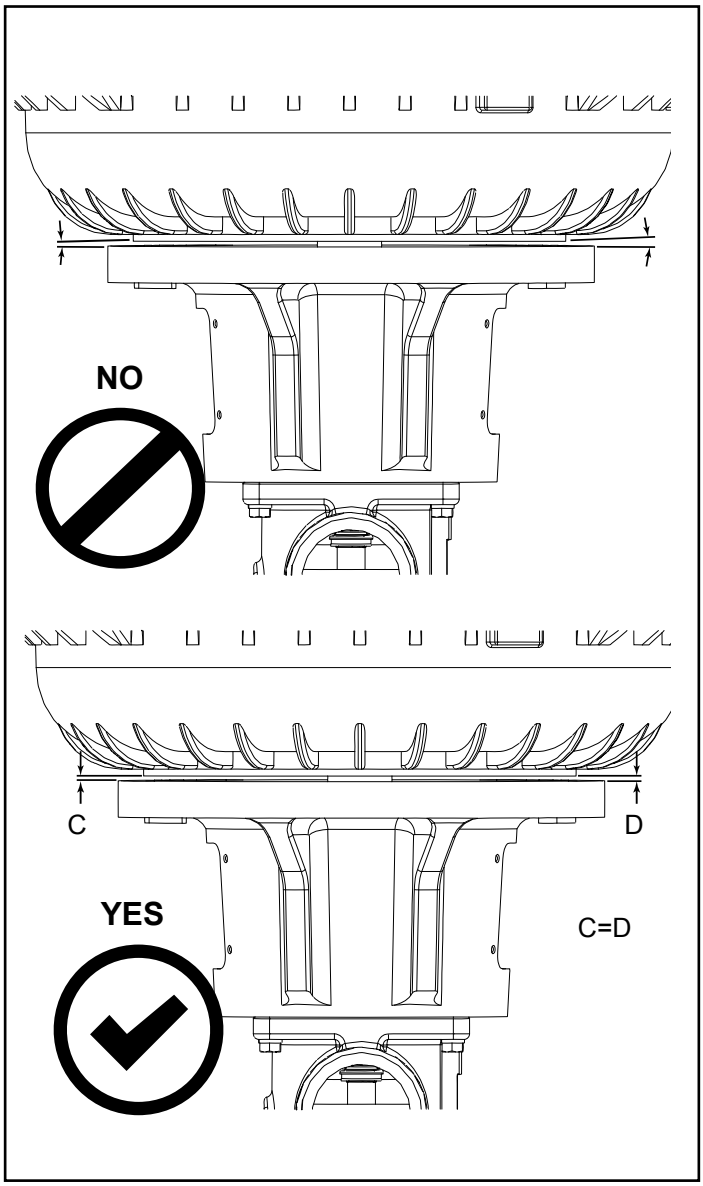

Figure 29 Proper Side-to-Side Gap

Installation Procedures (cont.)

17. Measure the motor adapter gap and continue adjustment until the gap between the motor adapter and the motor is the same on both sides (Figure 29).

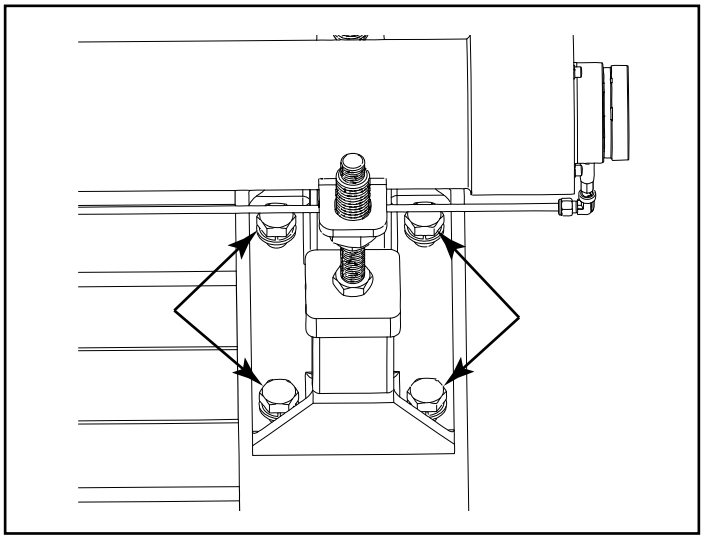

Figure 30 Securing Precision Leveling Foot

18. Tighten the precision leveling foot mounting bolts to specification for the size bolts used (Figure 30).

    NOTE: Do not secure the support brackets at this time.

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Installation Procedures (cont.)

19. Carefully slide the pump away from the motor and proceed to the Final Pump Alignment procedure.

    NOTE: Make sure the pump is well supported and far away enough to provide sufficient room to install flexible coupling (Figure 31).

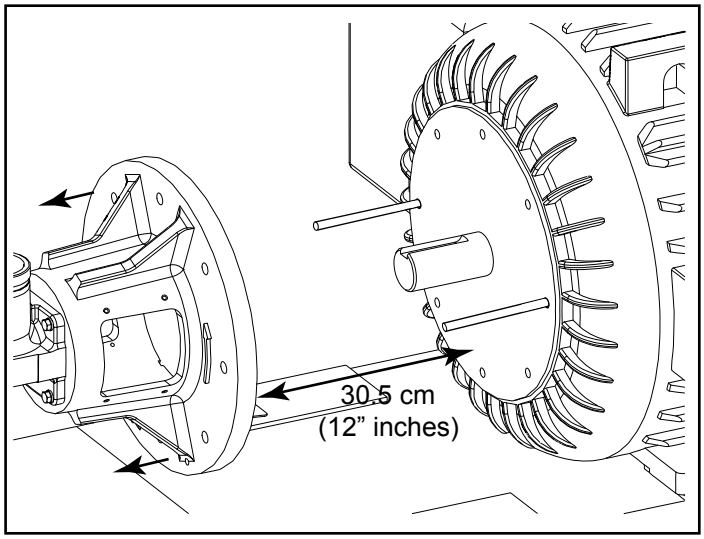

Figure 31 Separating Pump from Motor

Final Pump Alignment

20. Apply system compliant anti-seize compound in the motor shaft keyway and install the motor shaft key (Figure 32).

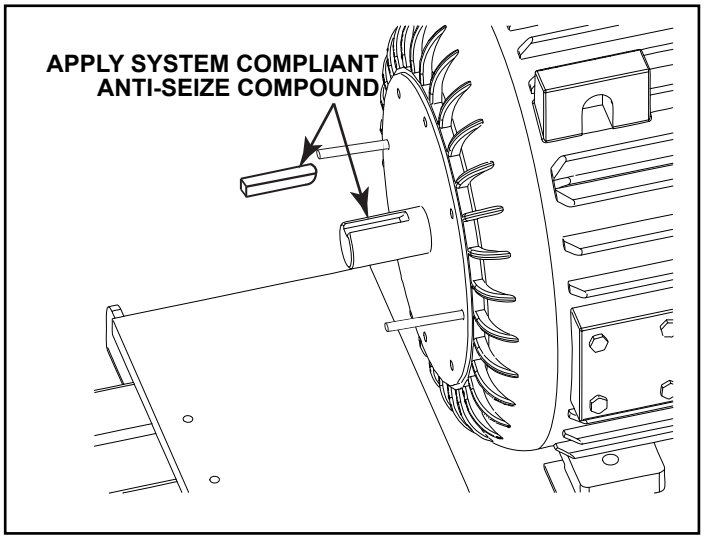

Figure 32 Installing Motor Shaft Key

21. Slide the flexible coupling onto the motor shaft until the end of the motor shaft is flush with the end of the motor half of the flexible coupling (Figure 33).

    NOTE: The motor shaft and its key should NOT be touching the plates of the flexible coupling disc pack. Ensure that the motor shaft key does not slide out of place or project past the end of the motor shaft.

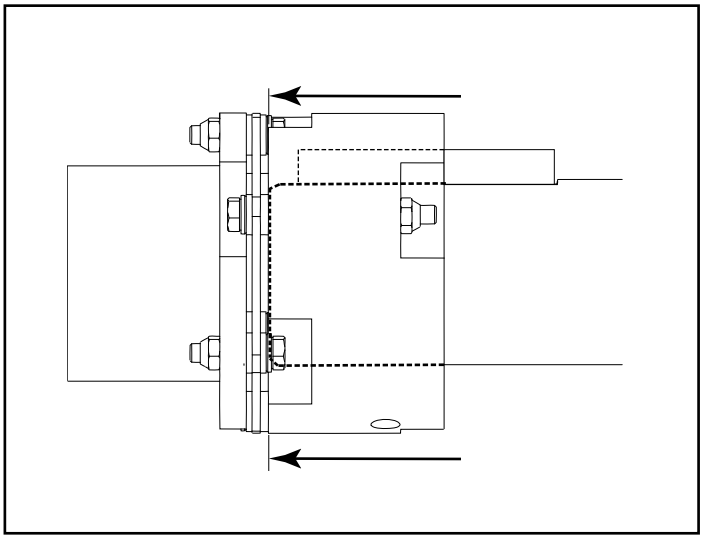

Figure 33 Positioning Flexible Coupling on Motor Shaft

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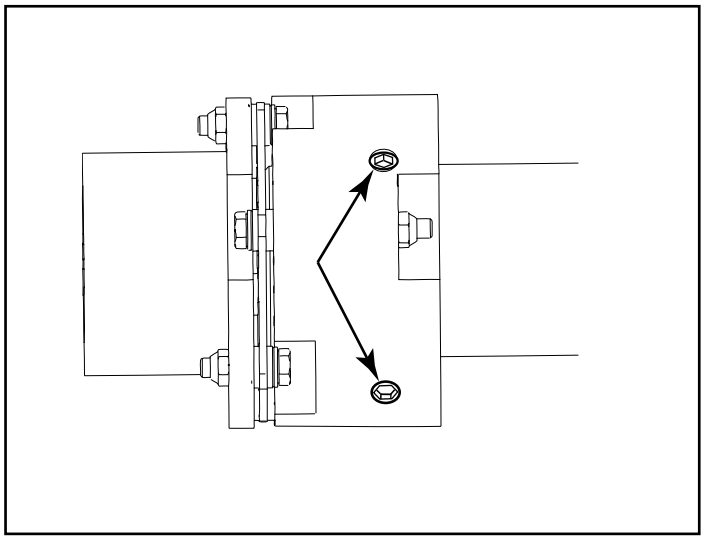

Figure 34 Flexible Coupling Set Screw Locations

Installation Procedures (cont.)

22. Install the two (2) flexible coupling set screws and tighten (Figure 34).

    NOTE: DO NOT attempt to install any set screws on the pump shaft side of the coupling.

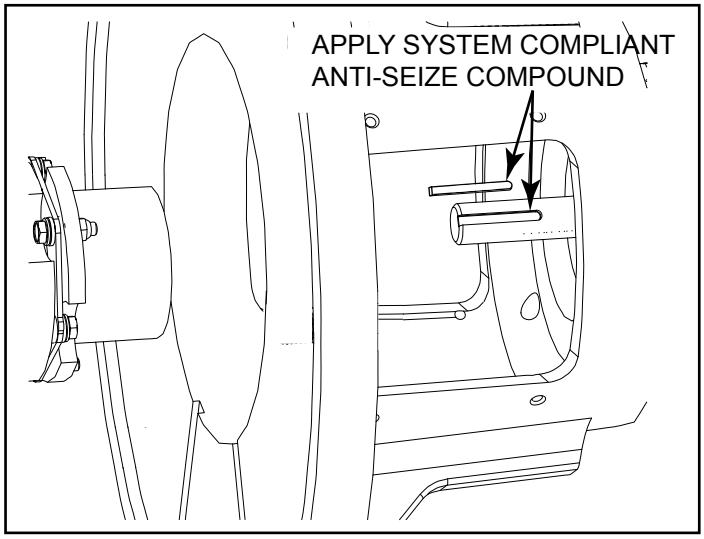

Figure 35 Pump Shaft Key Installation

23. Apply system compliant anti-seize compound into the pump shaft keyway and install the pump shaft key (Figure 35).

    NOTE: The rounded end of the key must be placed in the rounded end of the keyway.

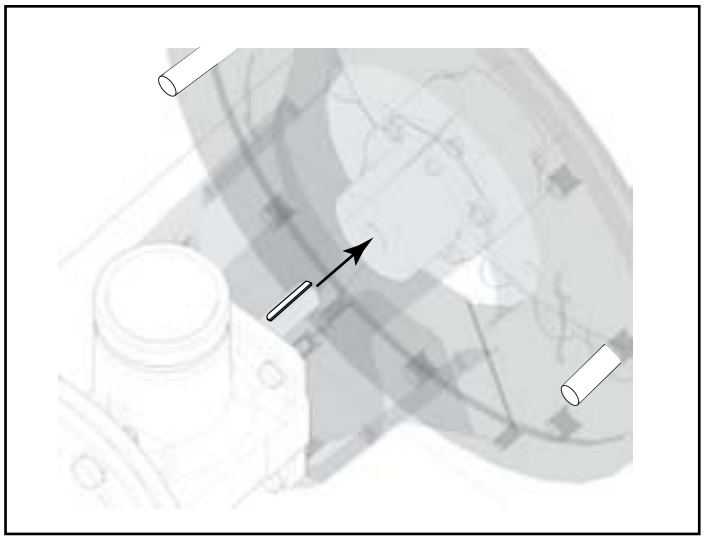

Figure 36 Aligning Pump Shaft Keyway

24. Rotate both shafts until the pump shaft key and the flexible coupling keyway are on top and aligned (Figure 36).

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Installation Procedures (cont.)

25. Carefully slide the pump against the motor making sure the pump shaft key slides smoothly into the flexible coupling. Push the pump by hand until the motor adapter and motor are in contact (Figure 37).

    NOTE: Make sure pump shaft key does not jam or fall out during installation.

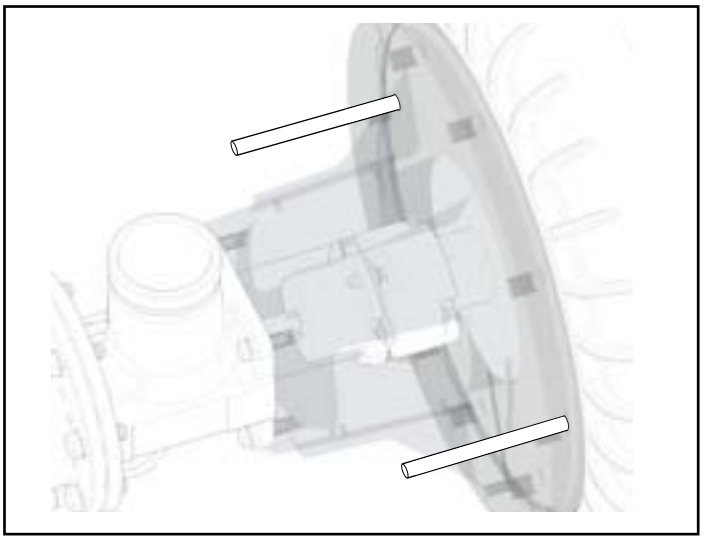

Figure 37 Position Pump for Final Alignment

26. Using feeler gauges, re-measure any gap between the motor adapter and motor at 4 different points 90° apart around the motor adapter (Figure 38).

    NOTE: In some instances, there may be no gap between the motor and motor adapter.

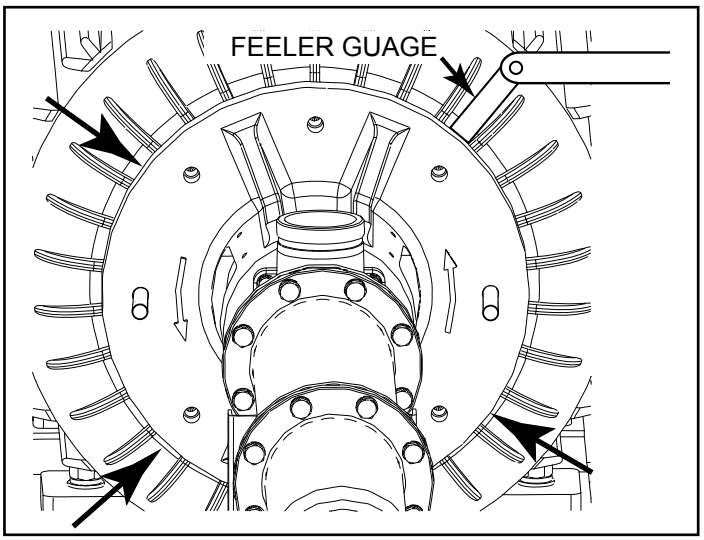

Figure 38 Motor Adapter Gap Measurement Points

27. If uneven gaps exist, adjust the precision leveling foot as necessary until any gaps between motor and motor adapter are all equal (Figure 39). The gap variation should not exceed 0.381 mm (0.015”) around motor adapter.

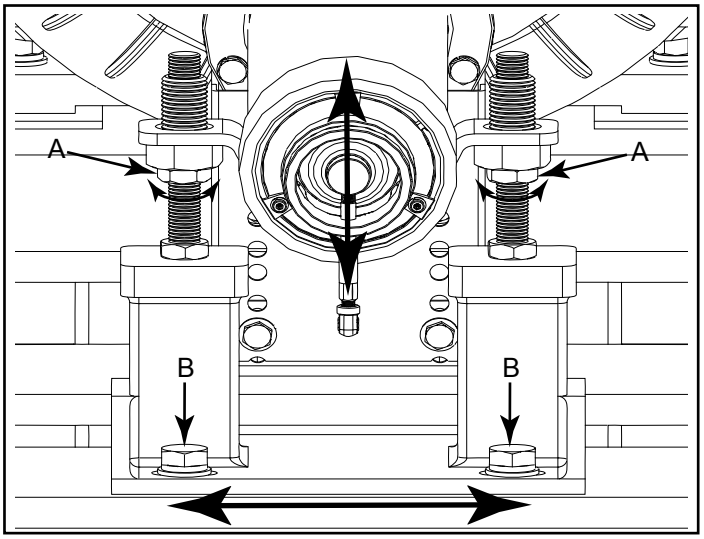

Figure 39 Precision Leveling Foot Adjustment

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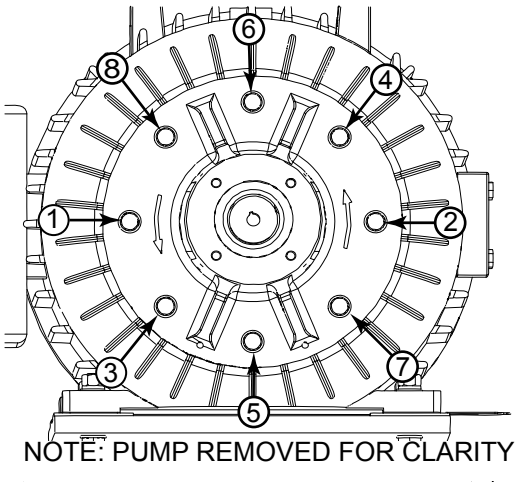

Figure 40 Motor Adapter Torque Sequence

Installation Procedures (cont.)

28. Install the eight (8) motor adapter bolts with washers and tighten to:
    3/8" bolts - 28 N-m (21 Lb-ft).
    1/2" bolts - 61 N-m (45 Lb-ft).

    NOTE: Tighten the motor adapter bolts in the sequence shown to minimize stress (Figure 40).

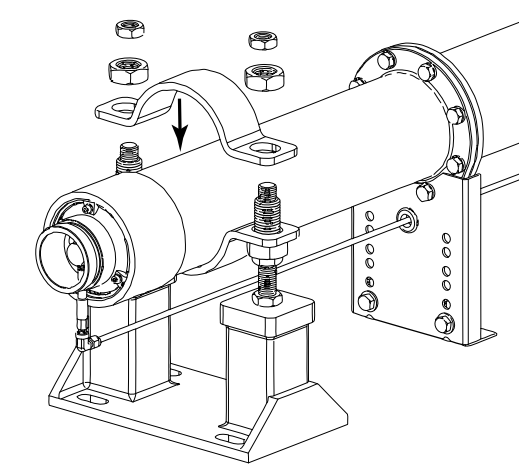

Figure 41 Installing Top Cradle

29. Install top cradle back onto the precision leveling foot (Figure 41). Tighten the four (4) top cradle nuts to 149 N-m (110 Lb-ft).

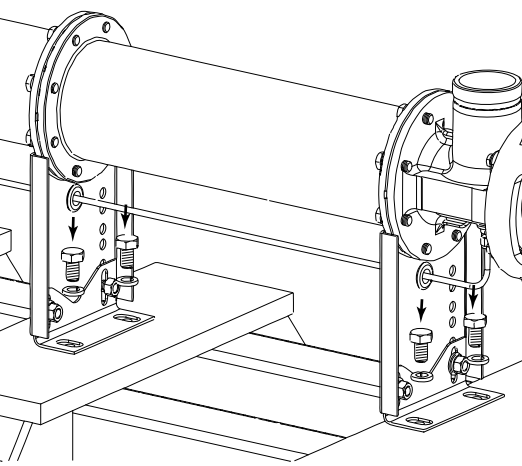

Figure 42 Pump Support Bracket Anchor Bolts

30. Install the support bracket anchor bolts with washers (Figure 42). Tighten to specification for the size bolts used.

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Installation Procedures (cont.)

31. Adjust each support bracket height and tighten the adjustment bolts to 61 N-m (45 Lb-ft) (Figure 42).

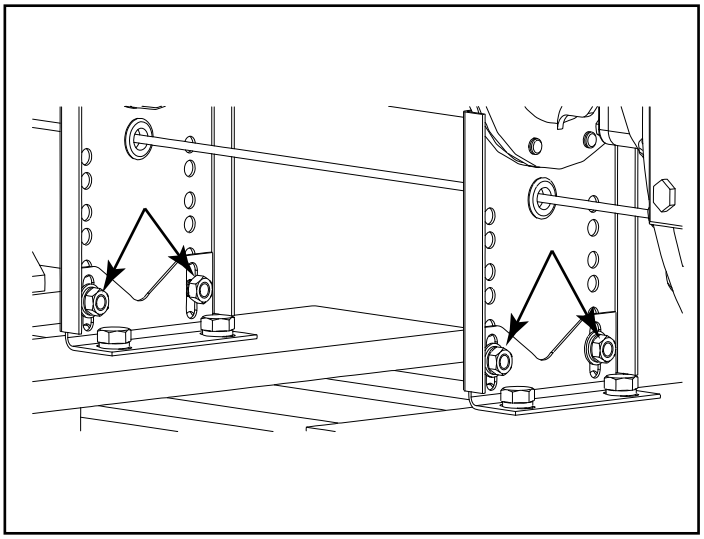

Figure 43 Pump Support Bracket Adjustment Bolts

32. Install the coupling guards and tighten the eight (8) screws (Figure 43).

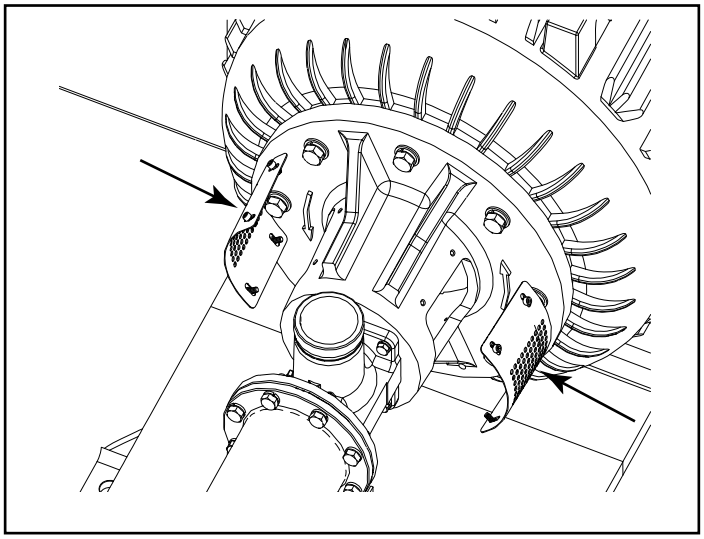

Figure 44 Coupling Guard Installation

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Installation Procedures (cont.)

Pump Piping Connections

Piping Alignment

- Accurate alignment and support of all piping connected to the pump is critical (Figure 45).
- Any movement occurring at the inlet or discharge pump connections may cause pump misalignment and stress over time.
- Do not force any misaligned pipes to connect to the pump discharge or inlet.

Pipe Couplings

- Use only grooved type couplings at all pump and pipe connections (Figure 46).
- Follow all manufacturer installation and torque specifications.
- Align all piping carefully before installing couplings.
- DO NOT use couplings to force piping to align. Make sure all seals seat correctly inside the coupling.
- If piping or seals are not aligned correctly, leaking may occur under pressure.

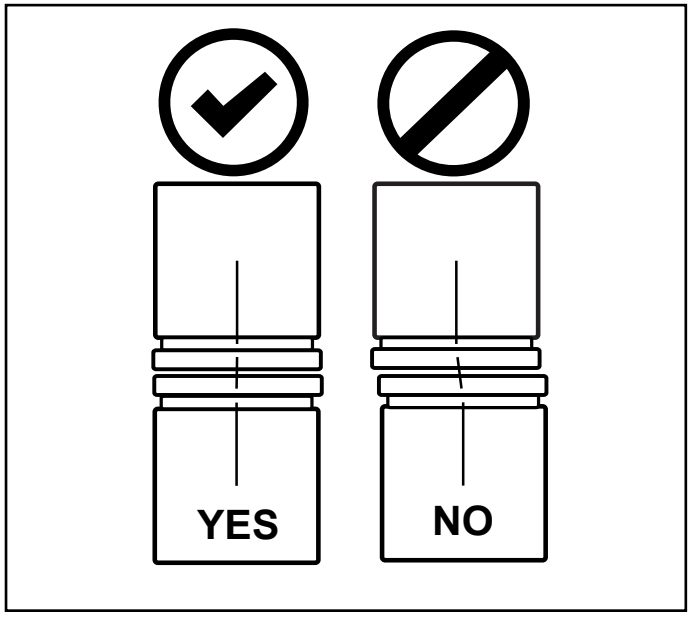

Figure 45 Proper Piping Alignment

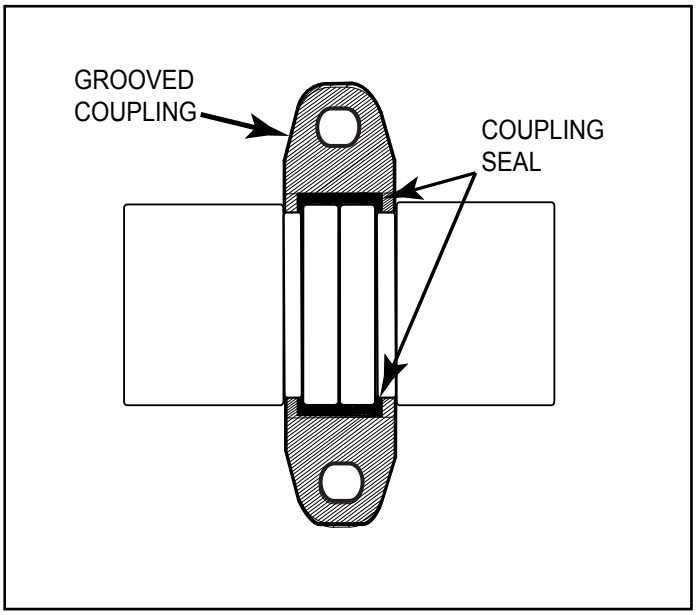

Figure 46 Typical Grooved Coupling

Inlet Piping

Keep the inlet pipe free of high points which could trap air and could disrupt pump priming. Vacuum and/or pressure gages are recommended to allow measurement of pump inlet pressure. NEVER throttle the pump on the inlet side.

Outlet Piping

The pump discharge piping should have a removable section of pipe such as a spool piece or elbow to allow the pump to slide forward for service (Figure 47). Servicing the shaft seal, water bearing or flexible coupling requires a space of approximately 30.5 cm (12 inches) minimum. The pump assembly must be free to move away from the motor in order to gain access to these components.

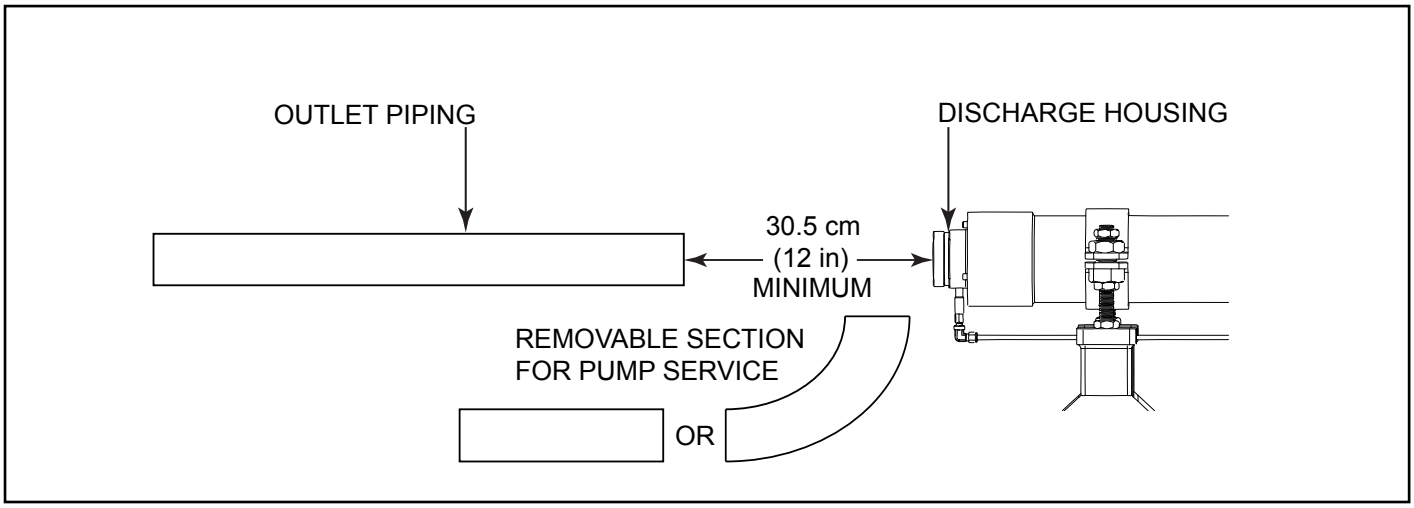

Figure 47 Removable Section for Pump Service

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Installation Procedures (cont.)

Optional High Pressure Seal Carrier

If equipped with an optional high pressure seal carrier, a vent line from the HPSC should be vented to the atmosphere and positioned to drain normally or connected to a low pressure manifold behind the first high pressure pump in the train (Figure 48).

WARNING

Under no circumstances should the vent line be plugged. A plugged vent line will result in insufficient water lubrication of the seal and balance disc causing internal damage to the unit.

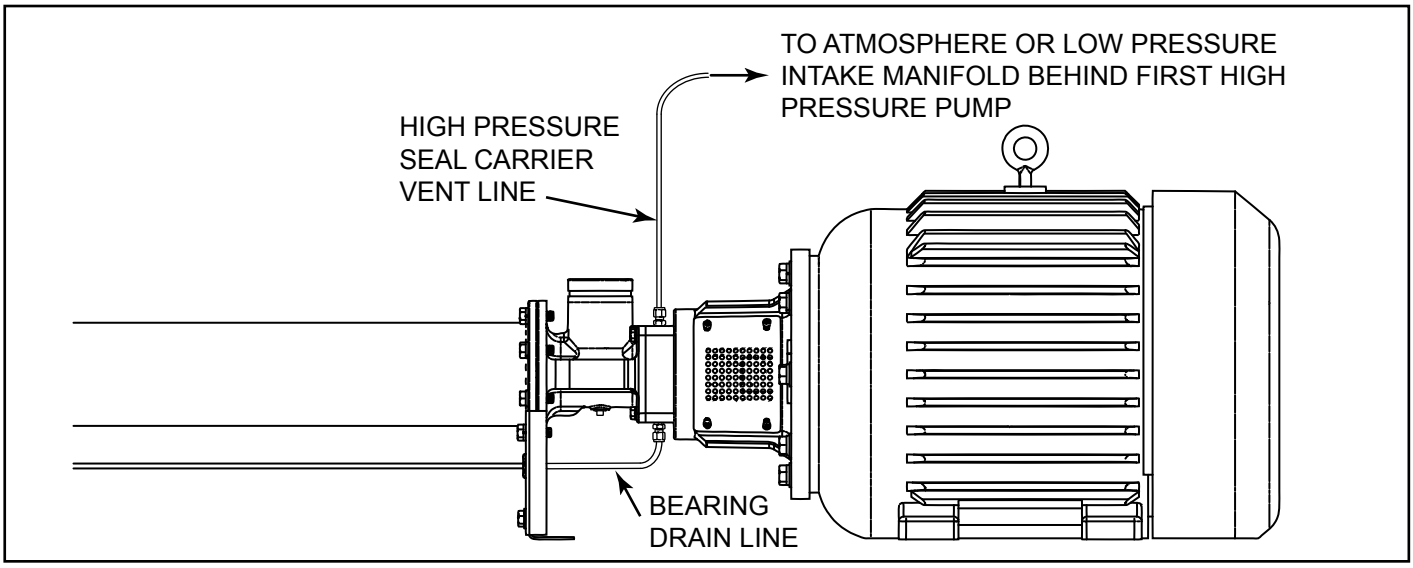
TO ATMOSPHERE OR LOW PRESSURE INTAKE MANIFOLD BEHIND FIRST HIGH PRESSURE PUMP
HIGH PRESSURE SEAL CARRIER VENT LINE
BEARING DRAIN LINE

Figure 48 High Pressure Seal Carrier Venting

Optional Shaft Position Sensor

The purpose of the shaft position sensor is to identify potential pump wear or failure before serious damage can occur. A shaft collar is fixed on a given point of the pump shaft. The shaft position sensor is positioned directly above the collar. If for any reason the shaft moves toward the motor, the collar moves out of range of the sensor shutting down the pump.

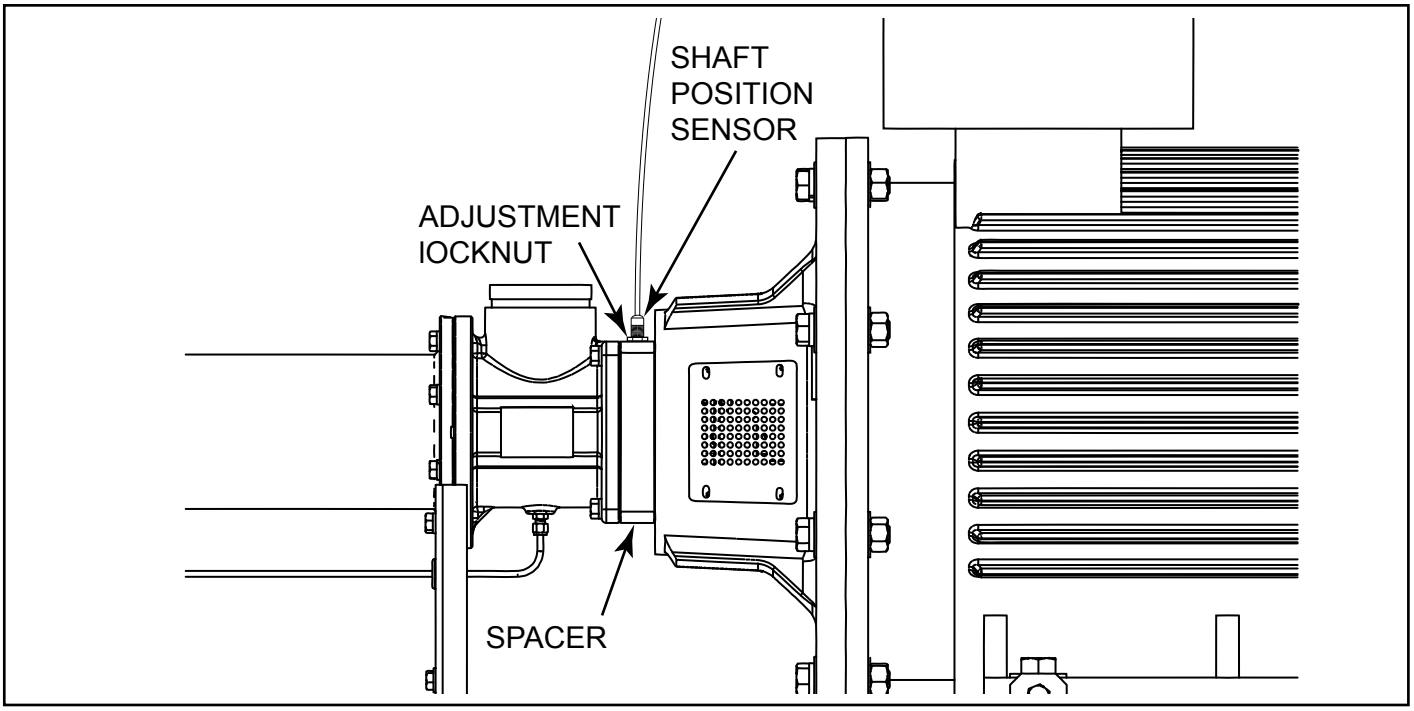

Figure 49 Shaft Position Sensor

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Installation Procedures (cont.)

Recommended Instrumentation and Operation

For safe pump operation, a pressure switch or relief valve is recommended for the high pressure side (before the membranes). Pressure gauges should be installed at the inlet and outlet of the MSS pump (Figure 50). If a throttle valve is used, an additional gauge is needed on the output side of the valve. It is recommended that a pressure switch should be installed at the pump inlet to prevent pump operation if the feed pressure to the pump is below specifications. MSS pumps are not equipped with a check valve to prevent back flow. Refer to the pump yellow tag and pump nameplate for equipment specifications (Figure 51).

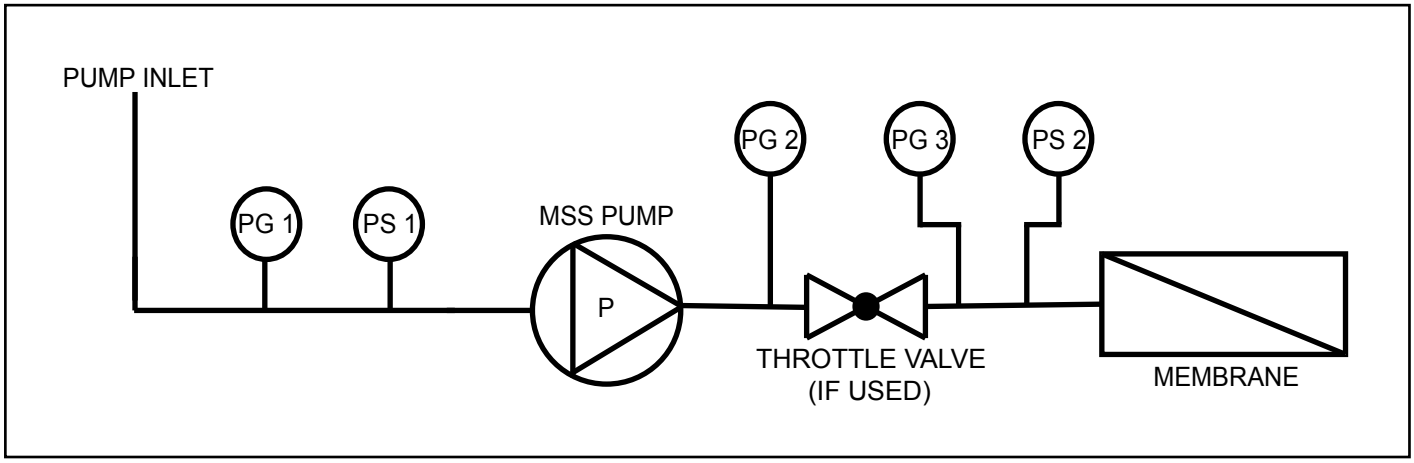
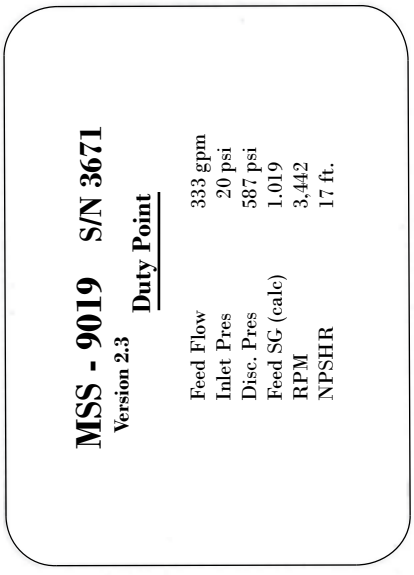


Figure 50 Recommended Instrumentation

YELLOW TAG FRONT



YELLOW TAG REAR

Fluid Equipment Development Co.
Monroe, MI USA
www . fedco - usa . com
Model: MSS - 1527
WT: 84.8 klg.
S/N: 3678 GPM: 58
RPM: 3508 TDH: 1188
U. S. Pantent #6309174
International patent pending

PUMP NAMEPLATE

Figure 51 Pump Operating Specifications

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Upstream Filtration

- The pump must be protected from debris in the feed water such as sand, gravel, or other particulate matter.
- A 20 micron filter must be installed upstream of the pump inlet to protect against foreign matter entering the system.
- Temporary strainers should be installed after initial start up or repairs to protect the pump from possible debris.

Preparation for Pump Start Up

Start Up Precautions

WARNING

NEVER operate the pump equipment:
- below the minimum flow rate.
- when dry.
- without priming.
- without proper guards and safety devices installed.
- with the discharge valve closed.
- with the suction valve closed.

ELECTRICAL HAZARD

Refer to the motor name plate, electrical junction box cover, or wiring tag for proper wiring. All electrical connections should be made by a licensed electrician according to all local codes and regulations. Be sure to follow all manufacturer's instructions on motor lubrication. Ensure motor rotational direction is correct according to the arrow located on the motor adapter (Refer to “Motor Rotational Direction Check”).

CAUTION

Electric motors may develop continual noise over long periods. Proper ear protection should be worn during pump operation. Most noise will emanate from the electric motor. The noise level of the MSS pump is nominal and depends on its size and operating conditions. The typical level can range from 75dB to 97dB, measured at a distance of 1 meter (39 inches) around the pump. Sound may vary due to hydraulic resonance, valves and building walls. For applications were a minimum noise level is required, the system should be operated with the flow adjusted as close to optimum efficiency as possible.

Start Up Check List

An additional Start Up Check List is available in the rear of this manual. Also use the Start Up Record at the rear of this manual to record initial operating conditions at pump start up.

- ☐ Flexible coupling set screws tightened.
- ☐ Motor adapter guards installed.
- ☐ All anchor bolts tightened to specifications.
- ☐ All pipe couplings tightened to specifications.
- ☐ Motor rotational direction correct.
- ☐ Motor lubricated to manufacturers specifications.
- ☐ Final Pump Alignment performed.
- ☐ Inlet pressure indicator installed.
- ☐ Inlet pressure switch (if applicable) installed.
- ☐ Outlet pressure indicator installed.
- ☐ System pipes are clean and upstream filtration in place.
- ☐ System leak checked and all air vented from system.
- ☐ ALL safety devices in place.

Pump Start Up

NOTE: Use the “Start Up Record” located in the rear of this manual to record initial operating conditions at pump start up.

1. Start low pressure booster pump and vent air from the system.
2. Verify that there are no leaks in the system.
3. Activate the MSS pump.
4. Inspect the system for leaks.

NOTE: Some mechanical shaft seal leakage may occur for about 60 seconds after pump start-up. If the leakage continues longer than 60 seconds then proceed with the mechanical shaft seal replacement procedure.

5. Observe any unusual system noise or vibration.
6. If a vibration meter is available, record a baseline vibration reading at this time.
7. Adjust system valves and controls as needed to obtain the desired operating condition.

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Basic Troubleshooting

If the MSS pump does not operate properly, refer to the following troubleshooting charts as a guide to determining the concern and identifying the potential cause. If after consulting the troubleshooting charts the cause is still undefined, contact FEDCO technical support www.fedco-usa.com and choose the "Service and Support" tab, telephone or FAX. FEDCO will give you easy, step by step instructions on how to proceed.

Visual Inspection

- Make sure all items are accounted for on the start up check list.
- Inspect all piping and electrical connections to the motor and pump.
- Inspect the pump and motor mountings for signs of any movement or vibration.
- Inspect pressure gauges, switches and all other instrumentation for proper operation.
- Record any unusual readings.

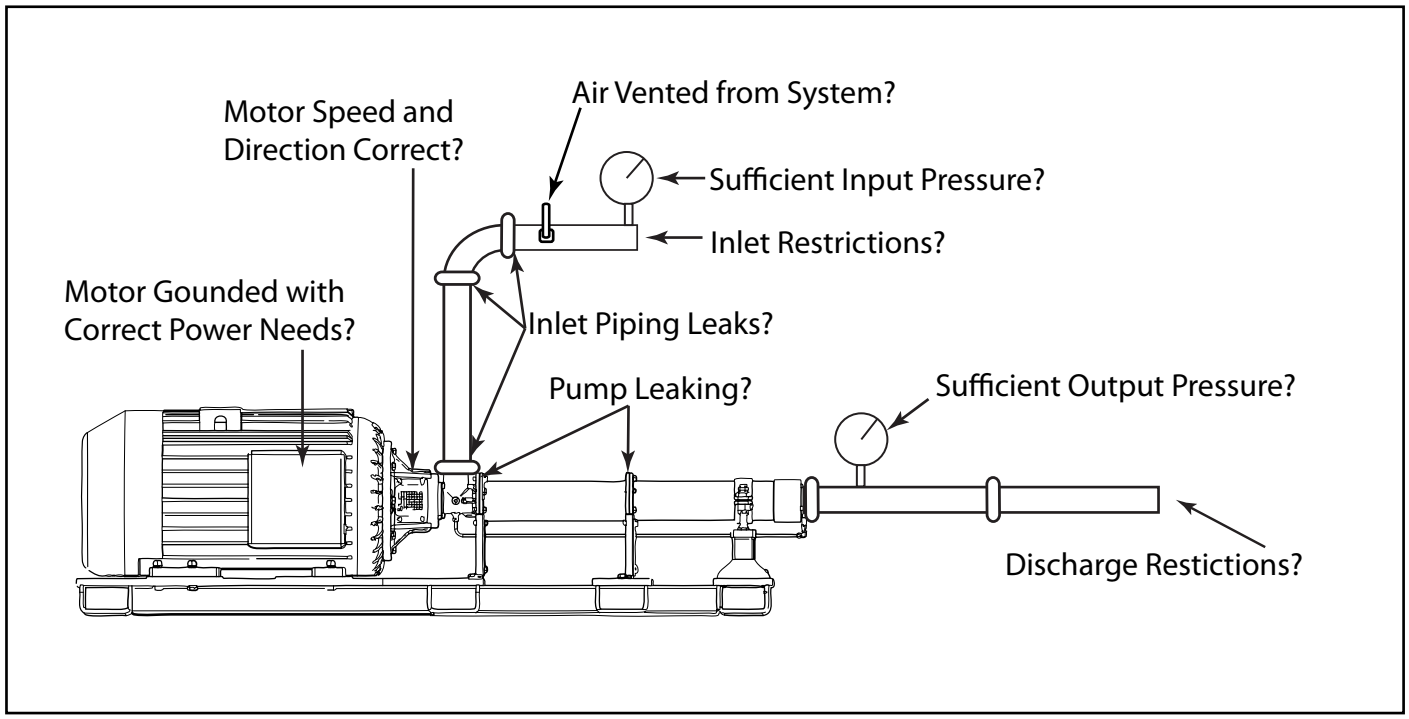

Figure 52 Basic Visual Inspection

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BASIC TROUBLESHOOTING

Symptom	Possible Cause	Action
Low flow or low pressure	Restriction in inlet or discharge pipes	- Check pump inlet pressure - Check position of all control valves - Check throttle valve is fully open
	Incorrect pump speed or direction	- Check VFD for proper speed setting (if equipped). - Check power supply frequency (50 or 60 Hz) - Check rotational direction of motor
	Gauges not operating properly	- Inspect gauges for proper operation.
	Air Leaks (vacuum on pump inlet)	- Inspect inlet piping joints for leaks - Inspect pump mechanical shaft seal for leaks
	Pump cavitation	- Check inlet pressure during operation - Check for excessive flow rate
	Air in casing	- Purge air from all piping
	Internal damage	- Inspect balance discfor damage - Inspect HPSC vent line for restrictions (if equipped)
	Design parameters	- Pump not designed for operating conditions
Pump vibration or noise	Operating conditions	- Pump Cavitation - Excessive flow rate - Insufficient flow rate
	Pump misalignment	- Inspect Alignment (Refer to “Final Pump Alignment”)
	Balance disc	- Inspect balance discfor damage - Inspect HPSC vent line for restrictions (if equiiped)
Pump Leaks	Pipe Joints	- Inspect pipe joints for insufficient sealing
	Pump Shell	- Inspect pump shell for damaged O-rings
	Pump Shaft	- Inspect mechanical seal for leakage - Inspect pump shaft for misalignment
Motor runs hot, is noisy or shuts off	Excessive Motor Load	- Check shaft position sensor adjustment (if equipped) - Check voltage supply for consistency - Check ambient air temperature - Check wiring and fuses for phase loss - Check flow rate and VFD settings (if equipped). - Check wiring length between motor and VFD (if equipped). - Check motor bearings **NOTE:** Contact motor manufacturer for proper repair procedures.

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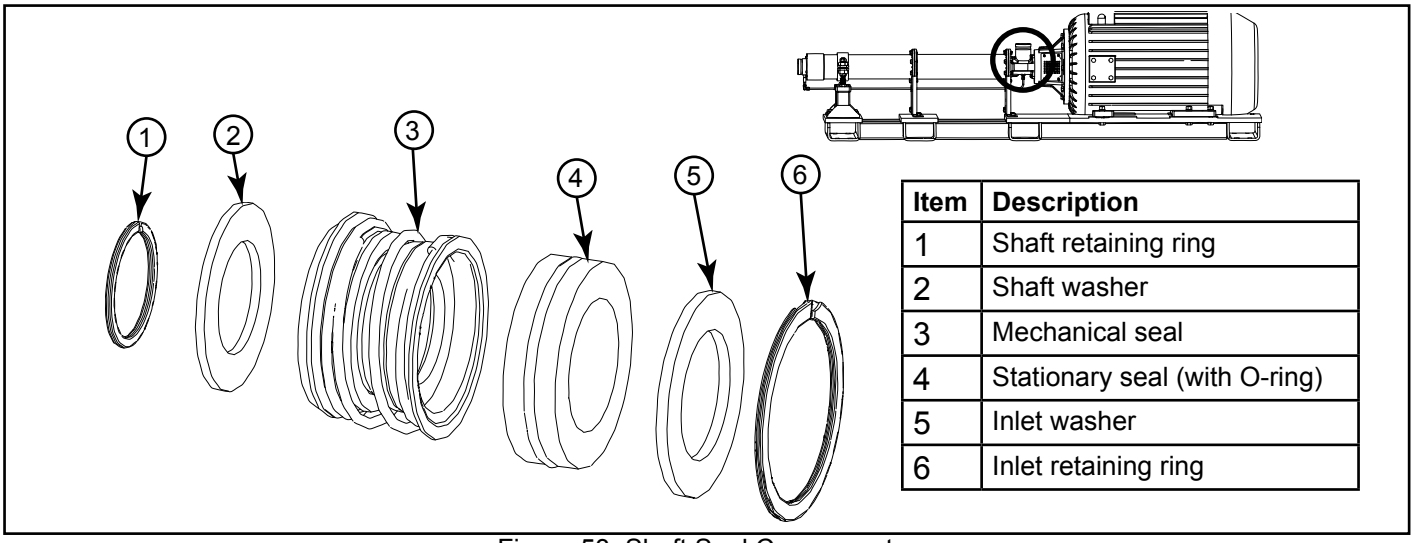
Standard Shaft Seal Replacement



Item	Description
1	Shaft retaining ring
2	Shaft washer
3	Mechanical seal
4	Stationary seal (with O-ring)
5	Inlet washer
6	Inlet retaining ring

Figure 53 Shaft Seal Components

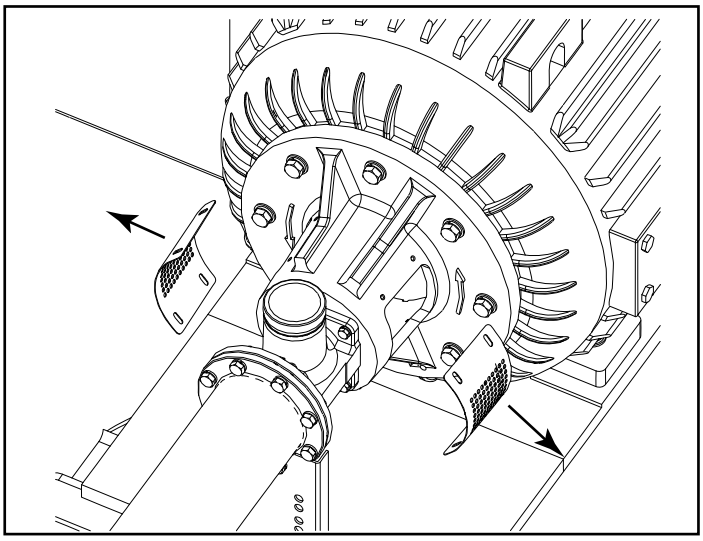


Figure 54 Coupling Guard Removal

Shaft Seal—Standard

ELECTRICAL HAZARD

Make sure to disconnect the power supply to the motor before carrying out component replacement procedures. Follow all Lock out/Tag out procedures developed by your company before starting any maintenance or repair.

Removal

1. Drain the piping and pump.
2. Disconnect the inlet and outlet piping.
3. Loosen the eight (8) screws and remove the coupling guards (Figure 54).

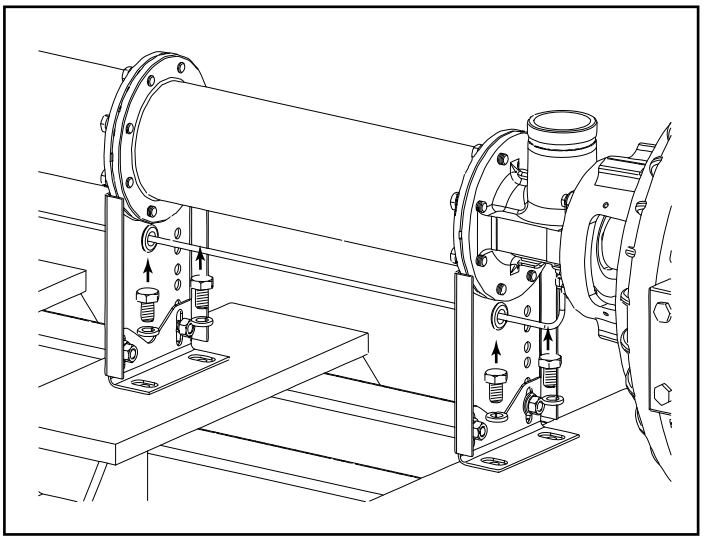


Figure 55 Support Bracket Anchor Bolt Removal

4. Remove the anchor bolts and washers from shell support bracket(s) (Figure 55).

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Standard Shaft Seal Replacement (Cont.)

5. Remove the eight (8) motor adapter bolts and washers (Figure 56).

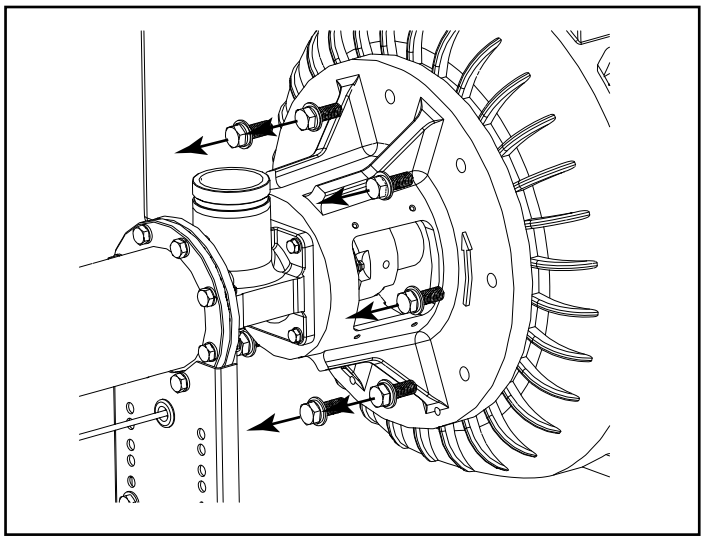

Figure 56 Motor Adapter Bolt Removal

6. Remove the four (4) nuts and the top cradle from the precision leveling foot (Figure 57).

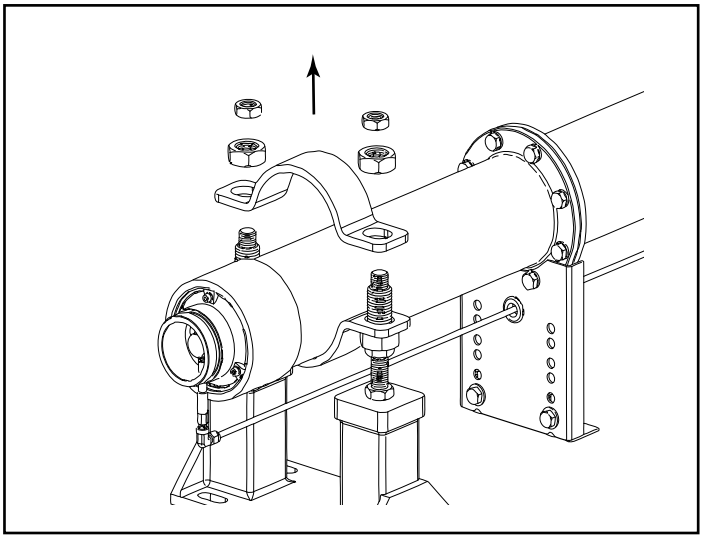

Figure 57 Top Cradle Removal

7. Install the two (2) alignment pins to prevent damage to mechanical seal and carefully slide pump 30.5 cm (12 inches) away from motor (Figure 58).

   NOTE: Make sure to support inlet end of the pump on support bracket(s).

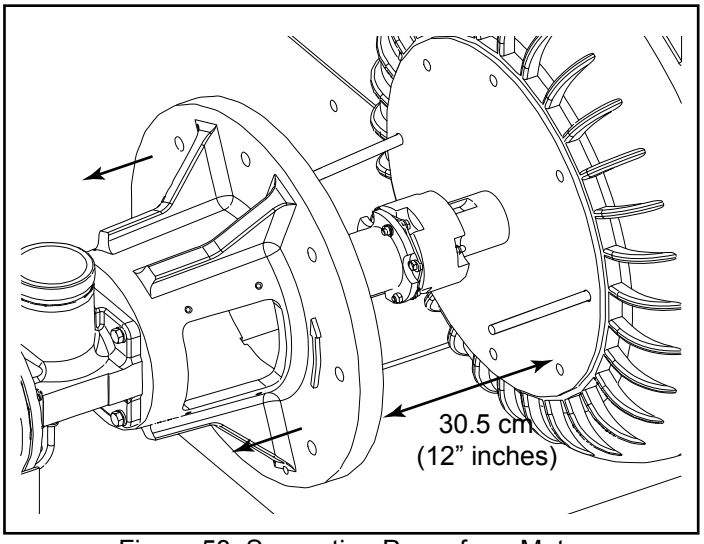

Figure 58 Separating Pump from Motor

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9 Standard Shaft Seal Replacement (Cont.)

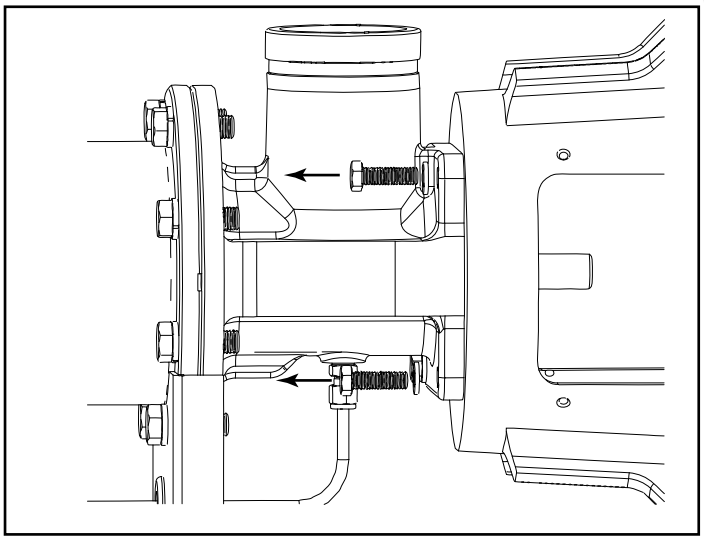

Figure 59 Removing Inlet Housing Bolts

8. Remove the four (4) inlet housing bolts and washers from Inlet Housing (Figure 59).

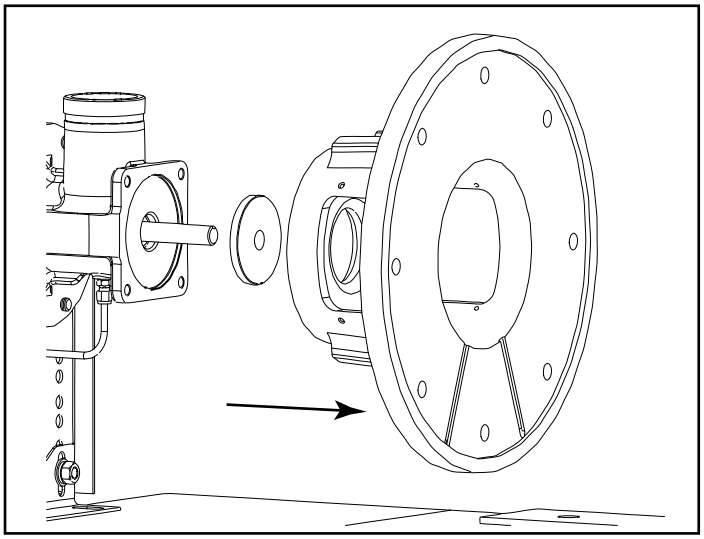

Figure 60 Removing Motor Adapter and Leakage Bushing

9. Remove the motor adapter and leakage bushing from the inlet housing (Figure 60).

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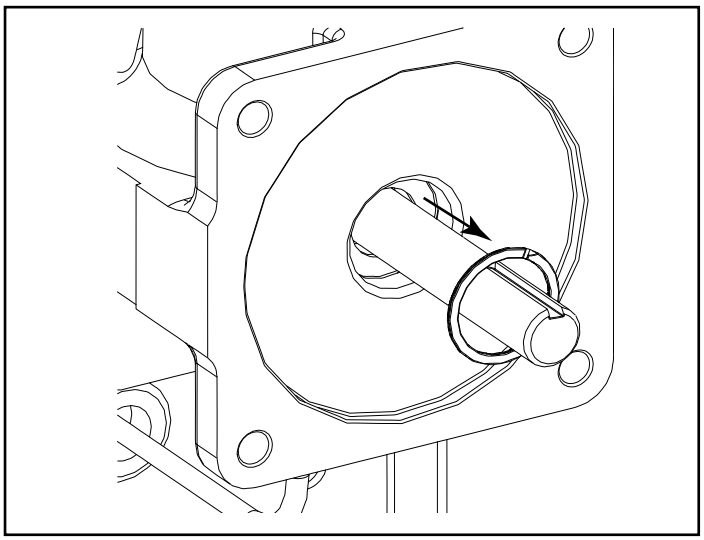

Figure 61 Removing Inlet Retaining Ring

10. Remove the inlet retaining ring from the inlet housing (Figure 61).

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Standard Shaft Seal Replacement (Cont.)

11. Apply soap and water to the shaft and using a suitable tool through the inlet housing fluid opening, gently push the shaft washer, mechanical seal, stationary seal and inlet washer toward the end of the shaft and remove (Figure 62).

    NOTE: Make sure to push the washer only. Do not push on the shaft retaining ring or damage may occur.

    NOTE: The shaft retaining ring does not need to be removed unless it is distorted or corroded and needs replacement.

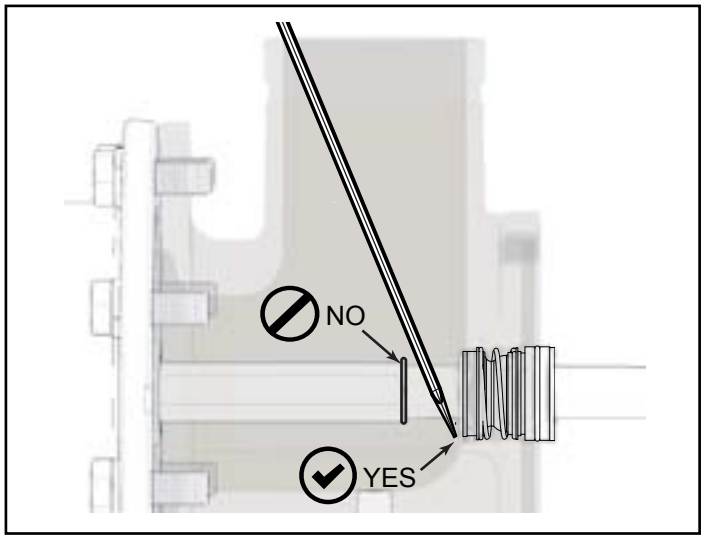

Figure 62 Removing Shaft Seal

12. Inspect the pump shaft, the shaft retaining ring, the inlet seal bore and the pump shaft for any damage (Figure 63). Remove any oil or dirt with a clean cloth.

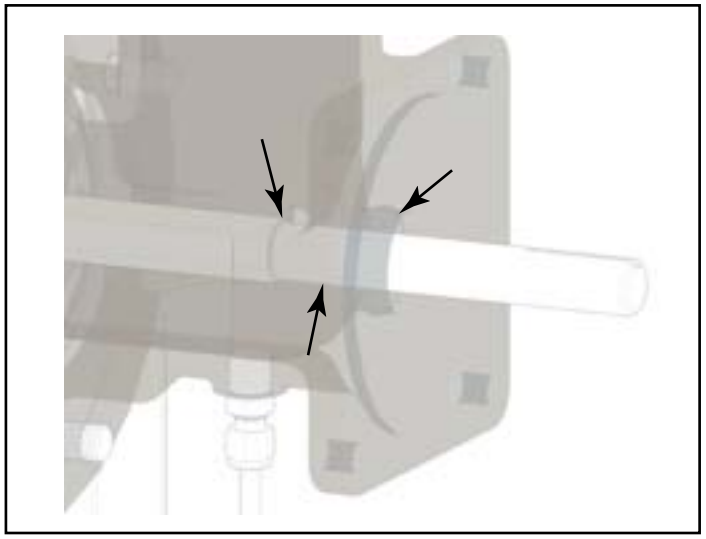

Figure 63 Inspecting Retaining Ring, Pump Shaft and Bore

Installation

1. Install the new shaft washer onto pump shaft and slide the washer against the shaft retaining ring (Figure 64).

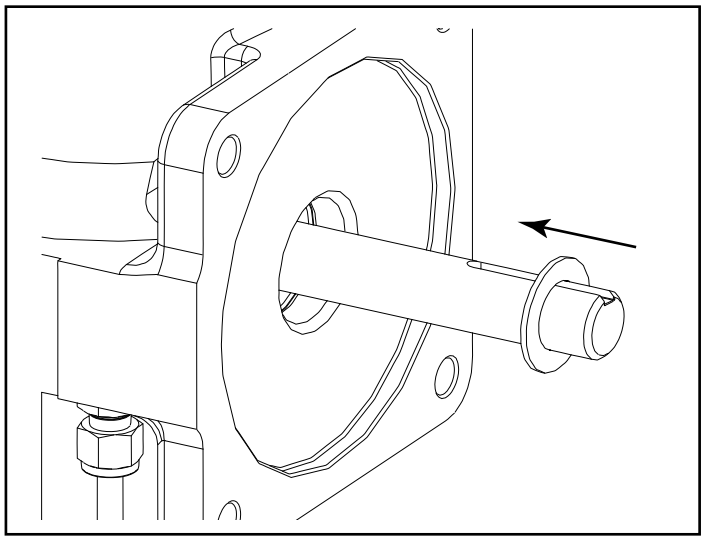

Figure 64 Installing Shaft Washer

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Standard Shaft Seal Replacement (Cont.)

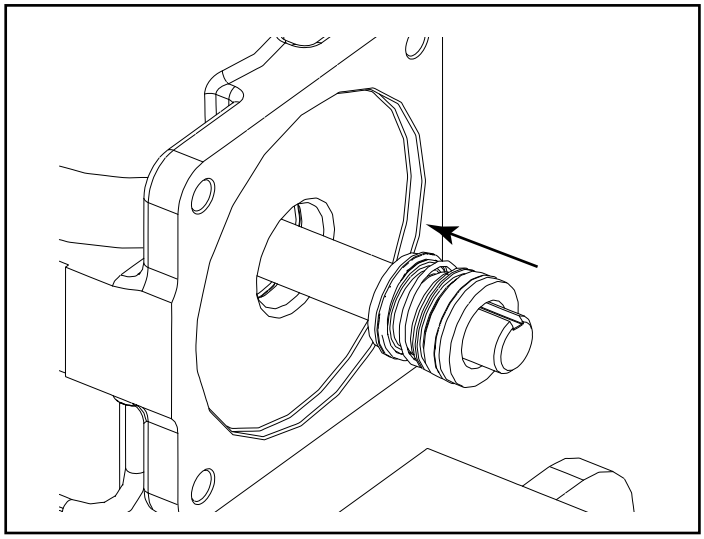

Figure 65 Installing Mechanical and Stationary Seals

2. Slide the new mechanical shaft seal followed by the new stationary seal and inlet washer onto shaft (Figure 65).

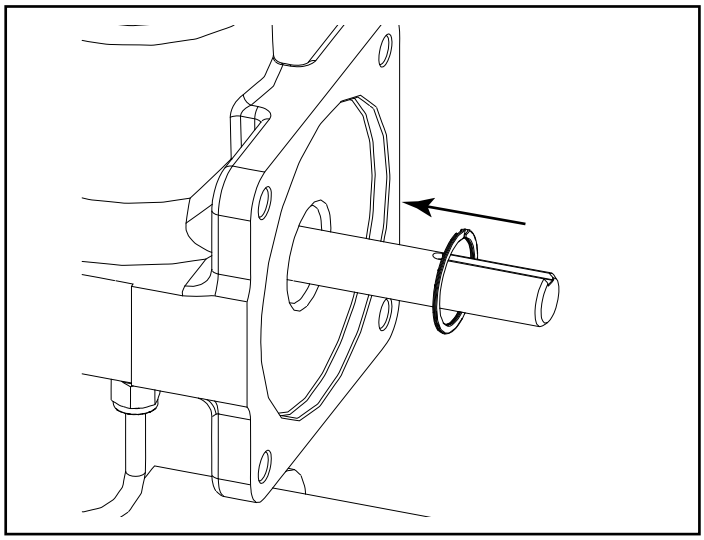

Figure 66 Installing Inlet Retaining Ring

3. Press in on the inlet washer and Install the inlet retaining ring into the groove in the inlet housing (Figure 66).

   NOTE: Make sure the inlet retaining ring is completely seated in the inlet housing groove.

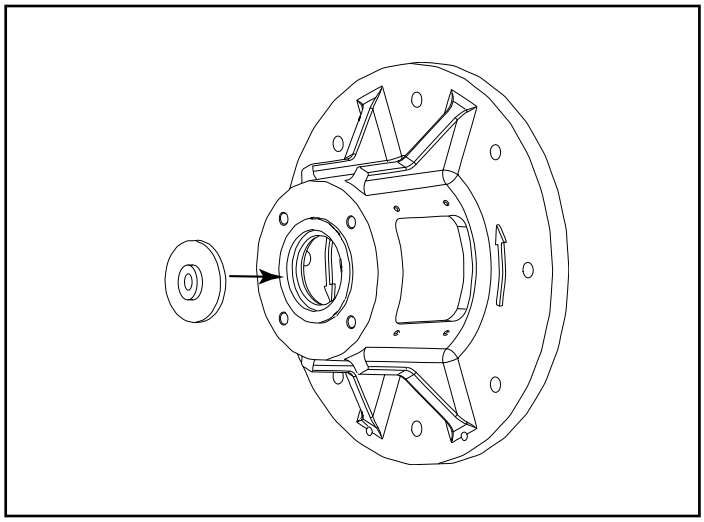

Figure 67 Installing Leakage Bushing

4. Install the leakage bushing into the motor adapter seat (Figure 67).

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Standard Shaft Seal Replacement (Cont.)

5. Secure the inlet housing to the motor adapter with the four (4) inlet housing bolts with lock washers (Figure 68). Tighten to 28 N-m (21 Lb-ft) .

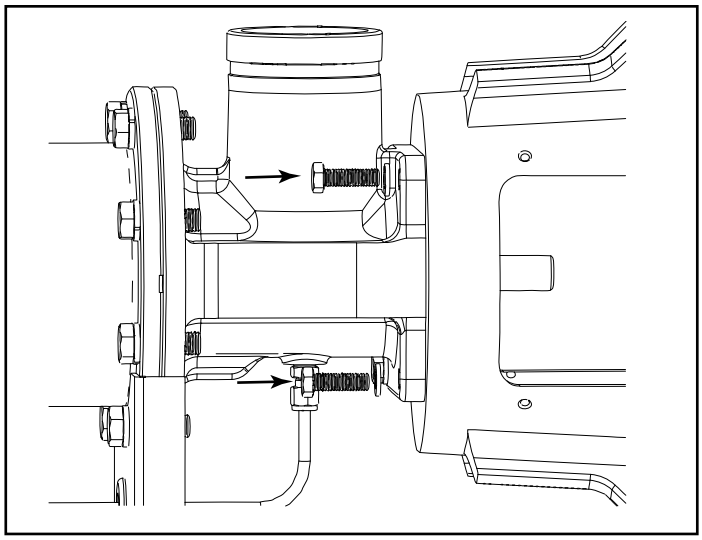

Figure 68 Installing Inlet Housing Bolts

6. Apply system compliant anti-seize compound into the pump shaft keyway and install the pump shaft key (Figure 69).

   NOTE: Key should fit securely with rounded end facing toward the pump.

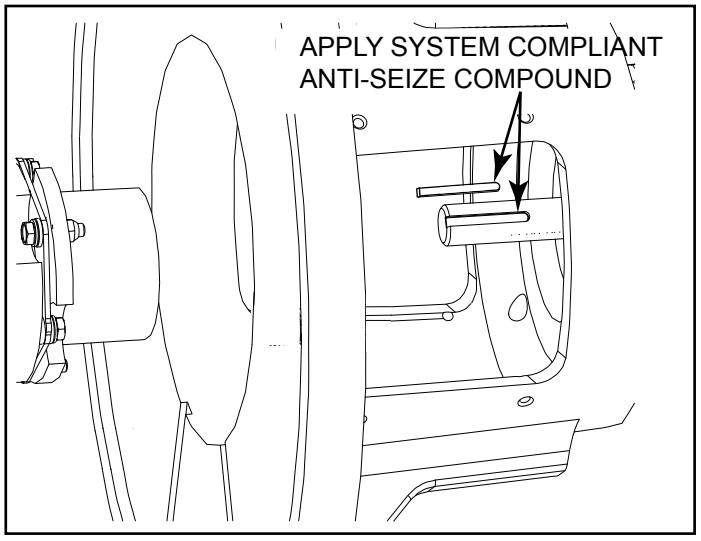

Figure 69 Installing Pump Shaft Key

7. Carefully slide the pump against the motor making sure the pump shaft key slides smoothly into the flexible coupling. Push the pump by hand until the motor adapter and motor are in contact (Figure 70).

   NOTE: Make sure pump key shaft does not jam or fall out during installation.

8. Refer to “Final Pump Alignment” earlier in this manual

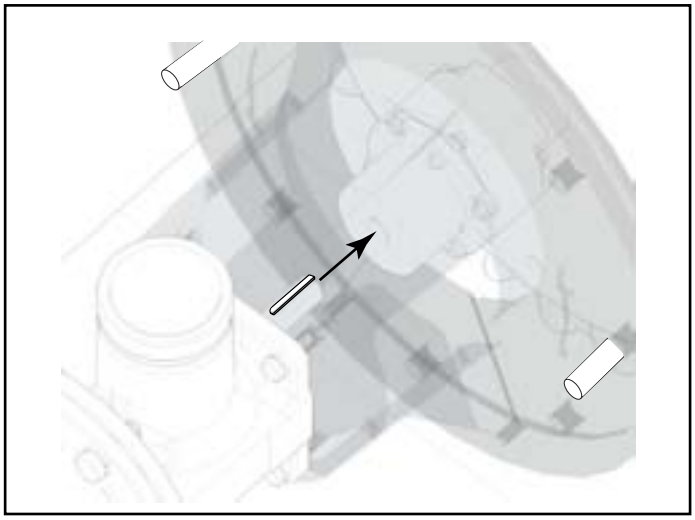

Figure 70 Attaching Pump to Motor

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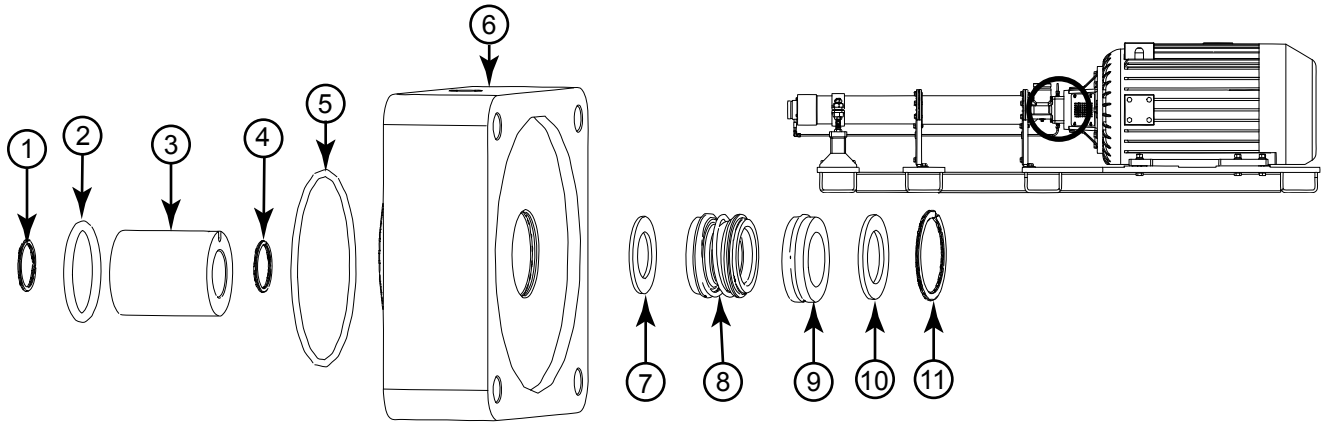
Optional High Inlet Pressure Seal Replacement



Item	Description	Item	Description
1	Graphite shaft sleeve retaining ring	7	Shaft washer
2	Graphite shaft sleeve O-ring	8	Mechanical seal
3	Graphite shaft sleeve	9	Stationary seal
4	Shaft retaining ring	10	Inlet washer
5	High pressure seal carrier O-ring	11	Inlet retaining ring
6	High pressure seal carrier		

Figure 71 High Pressure Seal Carrier Components

Shaft Seal—Optional High Inlet Pressure Design

ELECTRICAL HAZARD

Make sure to disconnect the power supply to the motor before carrying out component replacement procedures. Follow all Lock out/Tag out procedures developed by your company before starting any maintenance or repair.

Removal

1. Perform Steps 1 through 7 in “Shaft Seal-Standard” removal procedure.

2. Disconnect the drain line(s) from the high pressure seal carrier (Figure 72).

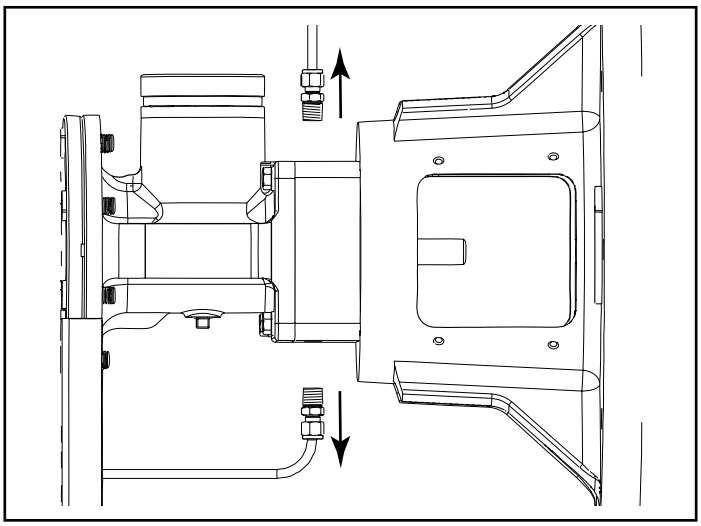


Figure 72 Disconnecting Drain Lines

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Optional High Inlet Pressure Seal Replacement (Cont.)

3. Remove the four (4) bolts and lock washers from the inlet housing (Figure 73).

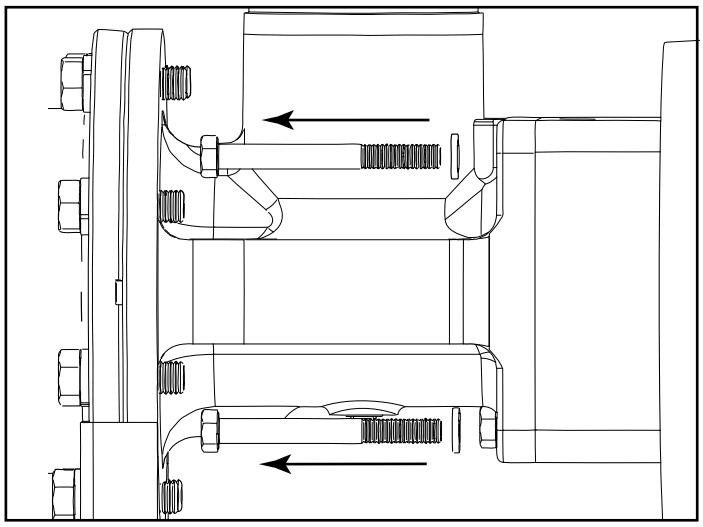

Figure 73 Removing Inlet Housing Bolts

4. Remove the motor adapter and leakage bushing from the inlet housing (Figure 74).

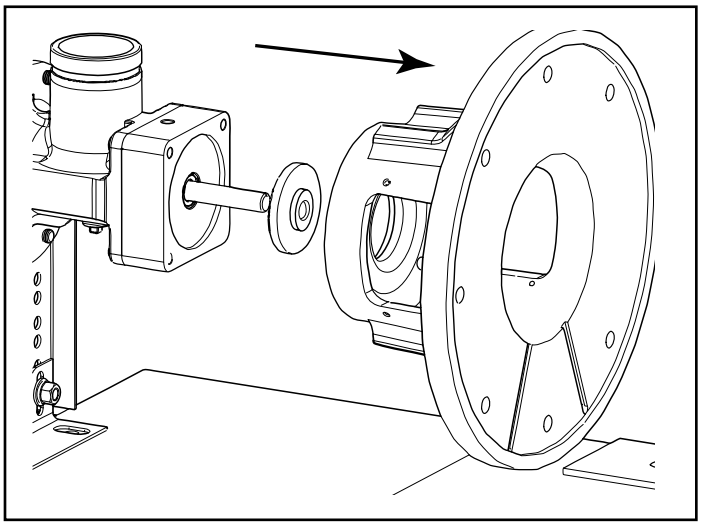

Figure 74 Removing Motor Adapter and Leakage Bushing

5. Remove the high pressure seal carrier from the inlet housing (Figure 75).

   NOTE: All seal components will slide out with the carrier.

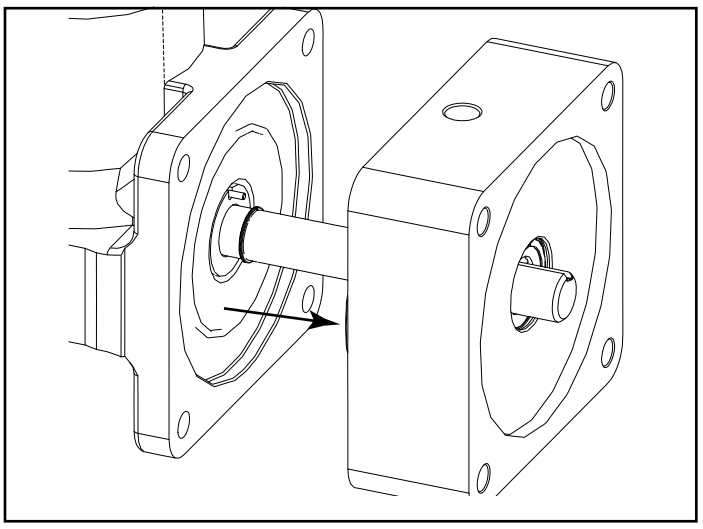

Figure 75 Removing High Pressure Seal Carrier

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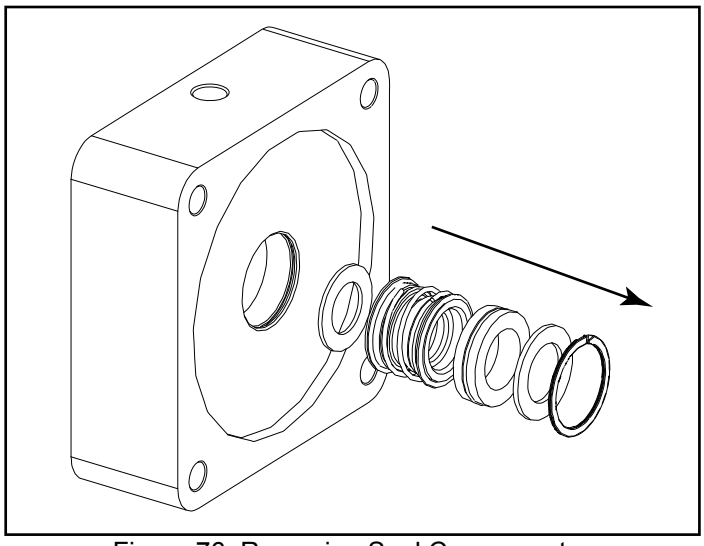

Figure 76 Removing Seal Components

Optional High Inlet Pressure Seal Replacement (Cont.)

6. Remove the Inlet retaining ring, inlet washer, stationary seal, mechanical seal and shaft washer carrier (Figure 76).

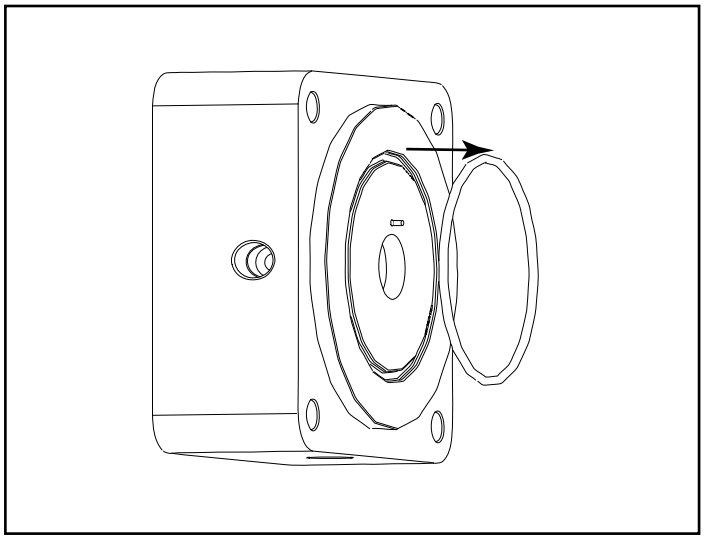

Figure 77 Removing High Pressure Seal Carrier O-Ring

7. Remove the high pressure seal carrier O-ring (Figure 77).

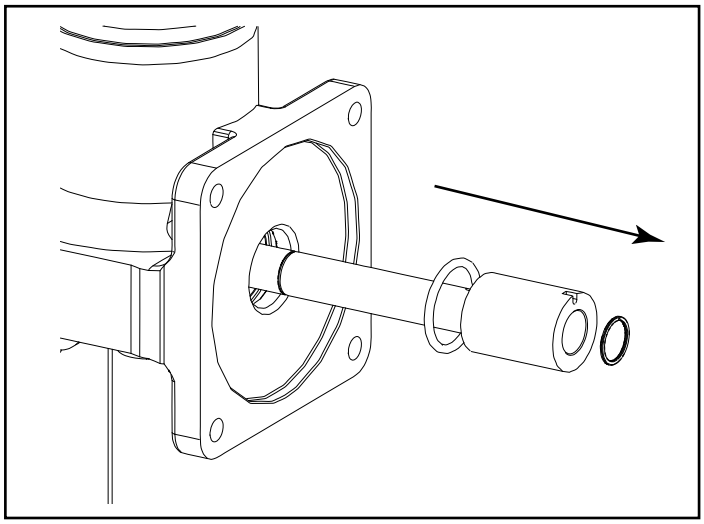

Figure 78 Removing Graphite Sleeve Components

8. Remove the shaft retaining ring, graphite shaft sleeve and O-ring (Figure 78).

NOTE: If retaining ring appears weak or distorted, replace it.

NOTE: The graphite shaft sleeve retaining ring does not need to be removed unless it is distorted or corroded and needs replacement.

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Optional High Inlet Pressure Seal Replacement (Cont.)

12. Inspect the high pressure seal carrier and inlet housing seal bores and shaft area for excessive wear or damage (Figure 79). Remove any oil of dirt with a clean cloth.

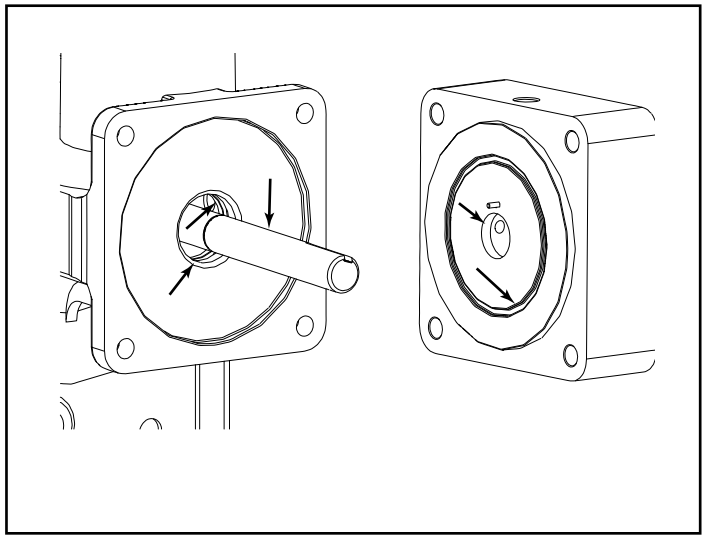

Figure 79 Inspecting Seal Carrier and Pump Shaft

Installation

1. Lubricate and install a new O-ring with the graphite shaft sleeve and shaft retaining ring (Figure 80).

   NOTE: Make sure the anti-rotation pin slot is aligned with the top of the shaft.

   NOTE: Make sure the graphite shaft sleeve retaining ring is completely seated in shaft groove.

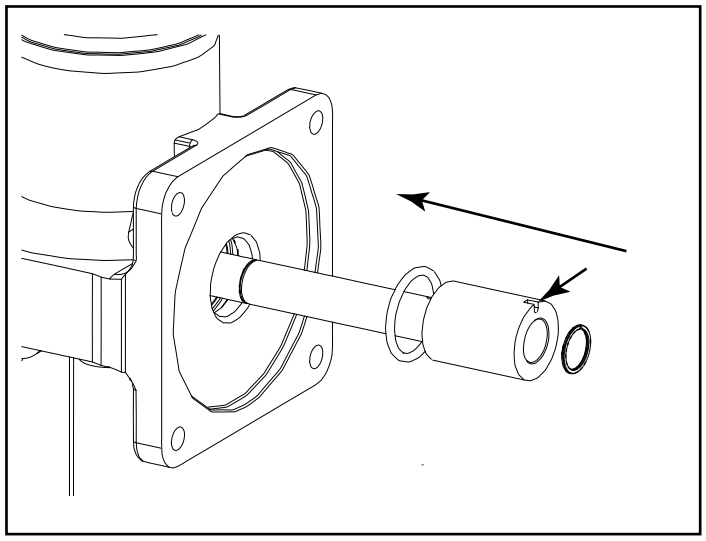

Figure 80 Installing Graphite Sleeve Components

2. Install the new high pressure seal carrier O-ring (Figure 81).

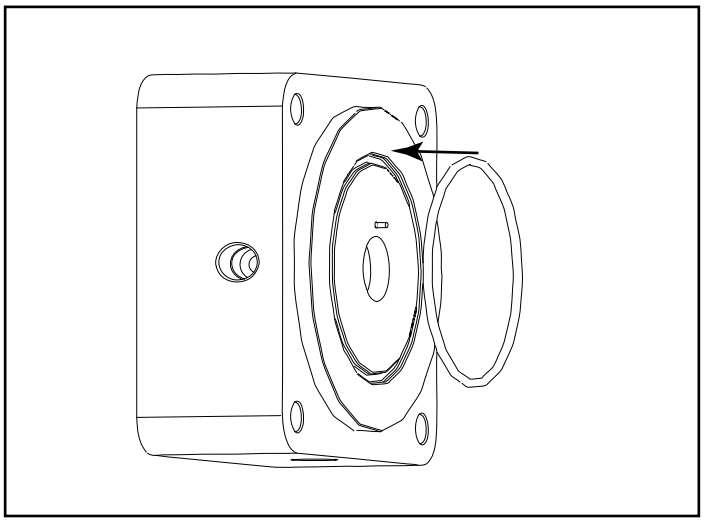

Figure 81 Installing New High Pressure Seal Carrier O-ring

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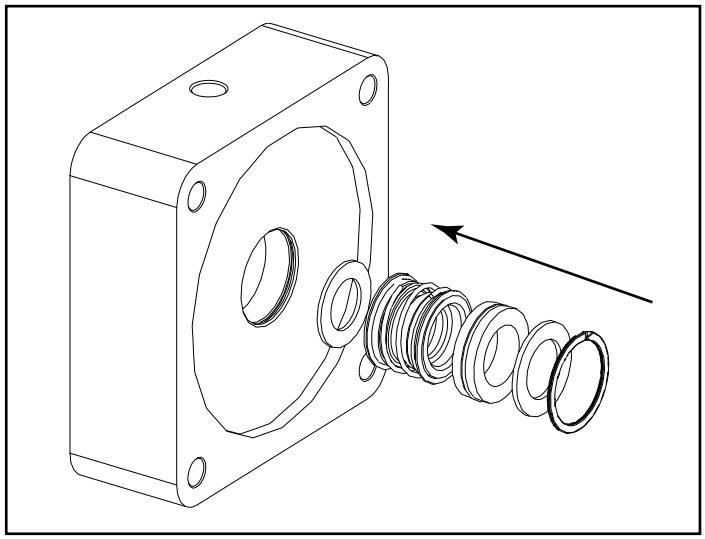

Figure 82 Installing Seal Components

Optional High Inlet Pressure Seal Replacement (Cont.)

3. Install the new shaft washer, mechanical seal, stationary seal and inlet washer. Secure with the inlet retaining ring (Figure 82).

   NOTE: Make sure the inlet retaining ring is completely seated in the high pressure seal carrier groove.

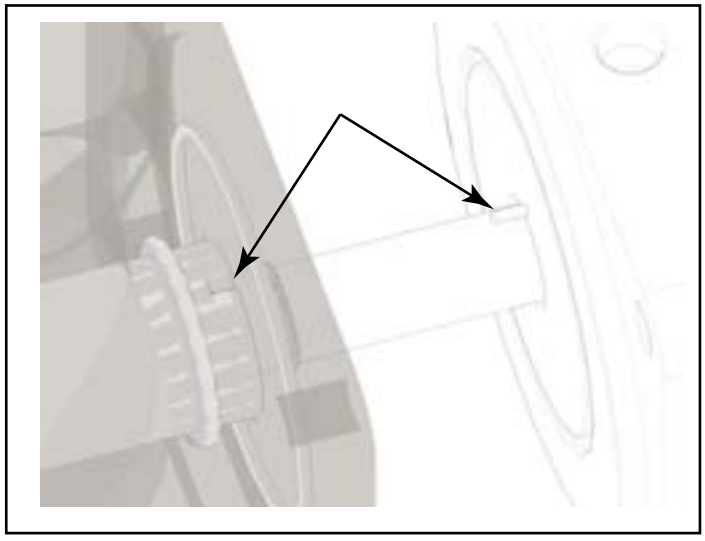

Figure 83 Aligning Graphite Shaft Sleeve

4. Position the high pressure seal carrier against inlet housing (Figure 83).

   NOTE: Make sure graphite shaft sleeve lines up with anti-rotation pin in high pressure seal carrier.

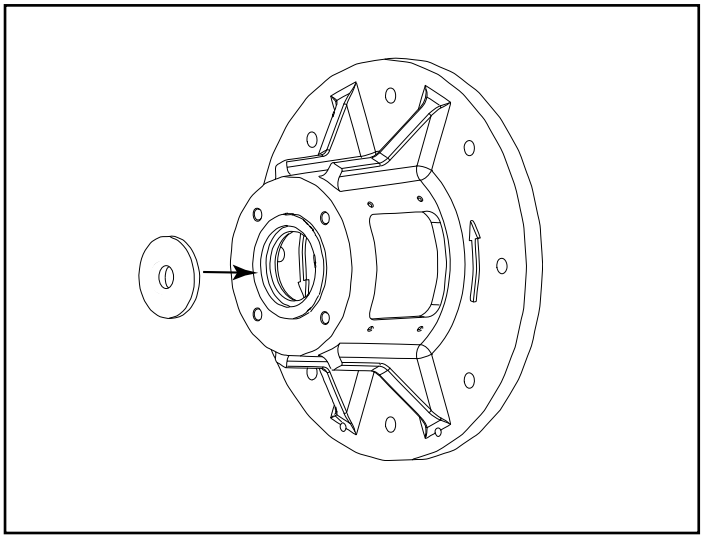

Figure 84 Installing Leakage Bushing

5. Install th leakage busing into the motor adapter seat (Figure 84).

   NOTE: For units equipped with a high pressure seal carrier, make sure the leakage bushing is installed with the stepped portion of the bushing facing inward toward the motor adapter.

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Optional High Inlet Pressure Seal Replacement (Cont.)

6. Install the motor adapter (Figure 85).

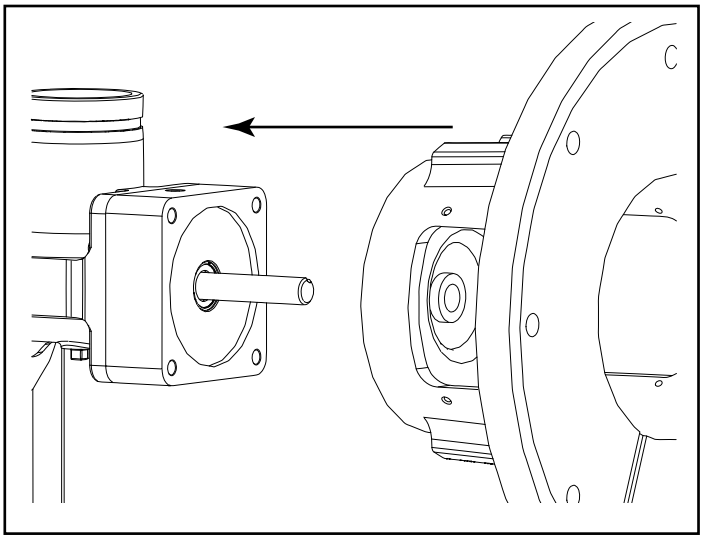

Figure 85 Installing Motor Adapter

7. Secure the motor adapter to the high pressure seal carrier and inlet housing with four (4) bolts and lock washers (Figure 86). Tighten to 28 N-m (21 Lb-ft).

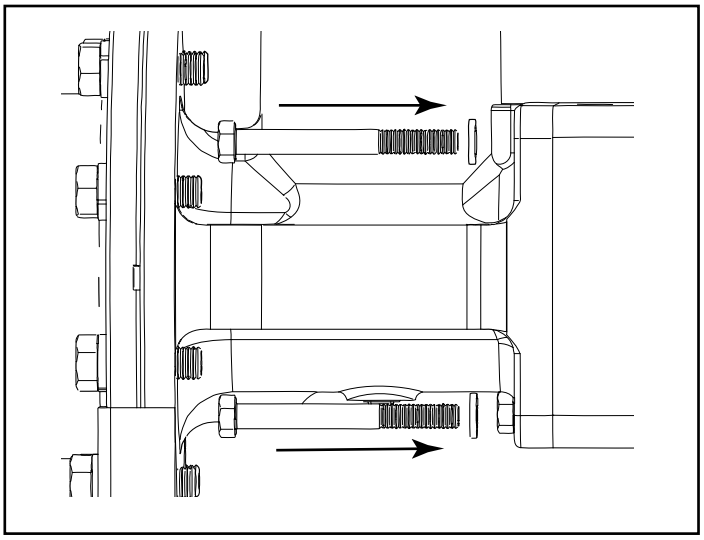

Figure 86 Installing High Pressure Seal Carrier Bolts

8. Connect the drain lines to the high pressure seal carrier (Figure 87).

   NOTE: Make sure the vent line is clean and unplugged. The line should be vented to the atmosphere and positioned to drain normally or connected to a low pressure manifold behind the first high pressure pump in the train. Under no circumstances should the vent line be plugged. A plugged vent line will result in insufficient water lubrication of the seal and balance disc causing internal damage to the unit.

9. Perform Steps 6, 7 and 8 in “Shaft Seal-Standard” installation procedure.

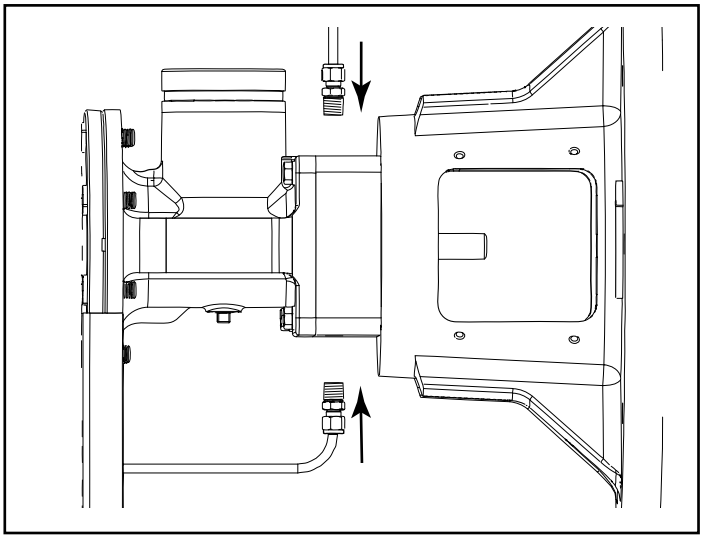

Figure 87 Installing Drain Lines

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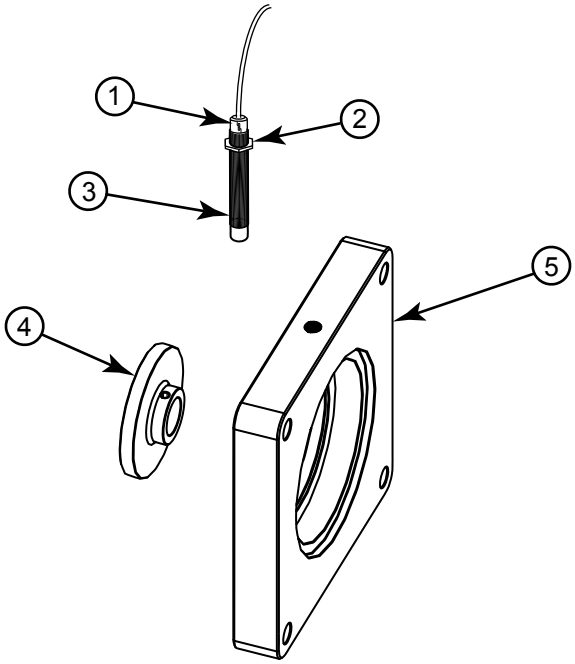
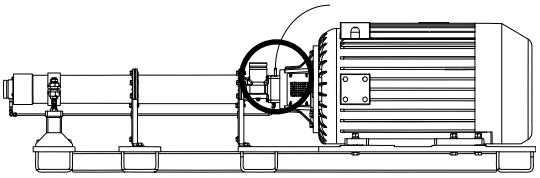
Optional Shaft Position Sensor Replacement





Item	Description
1	Light emitting diode
2	Adjustment shaft locknut
3	Shaft position sensor
4	Shaft collar
5	Spacer plate

Figure 88 Shaft Position Sensor Components

Optional Shaft Position Sensor

ELECTRICAL HAZARD

Make sure to disconnect the power supply to the motor before carrying out component replacement procedures. Follow all Lock out/Tag out procedures developed by your company before starting any maintenance or repair.

Removal

1. Disconnect the shaft position sensor from its power source.

2. Loosen the adjustment locknut at the top of the spacer plate (Figure 89).

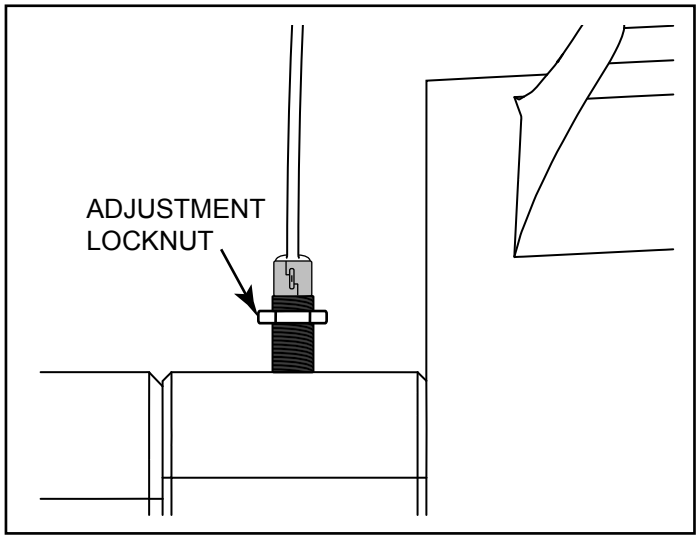


Figure 89 Loosening Adjustment Locknut

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Optional Shaft Position Sensor Replacement (Cont.)

3. Unscrew and remove the shaft position sensor from the spacer plate (Figure 90).

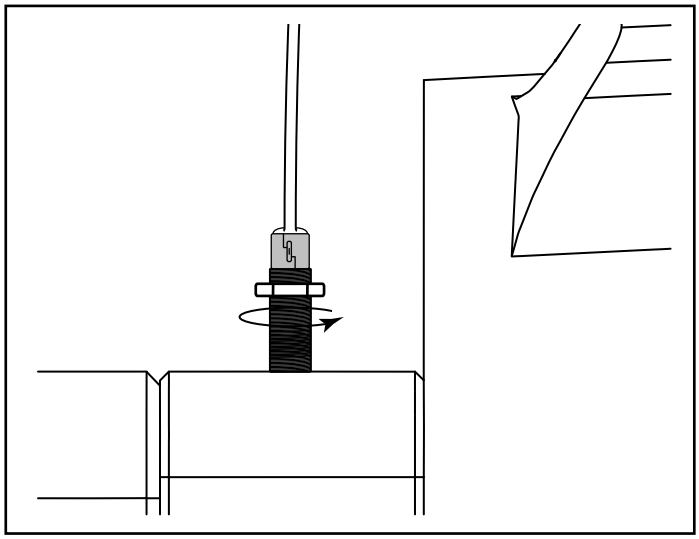

Figure 90 Removing Shaft Position Sensor

4. Inspect the shaft collar to ensure it has not moved from its position on the pump shaft (Figure 91).

   NOTE: If the shaft collar has moved on the pump shaft, inspect the set screw keyway on the pump shaft for excessive wear.

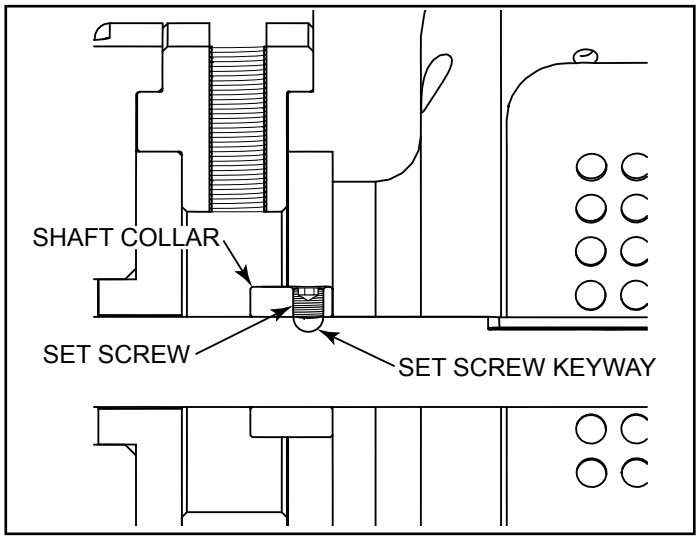

Figure 91 Inspecting Shaft Collar

Installation

CAUTION

DO NOT supply the shaft position sensor with current and voltage higher than the sensor is rated to operate at. Higher than rated electrical current or voltage may damage the sensor.

1. Connect a temporary power supply to the shaft position sensor which will allow the sensor to rotate.

2. Loosely thread the shaft position sensor into the spacer plate (Figure 92).

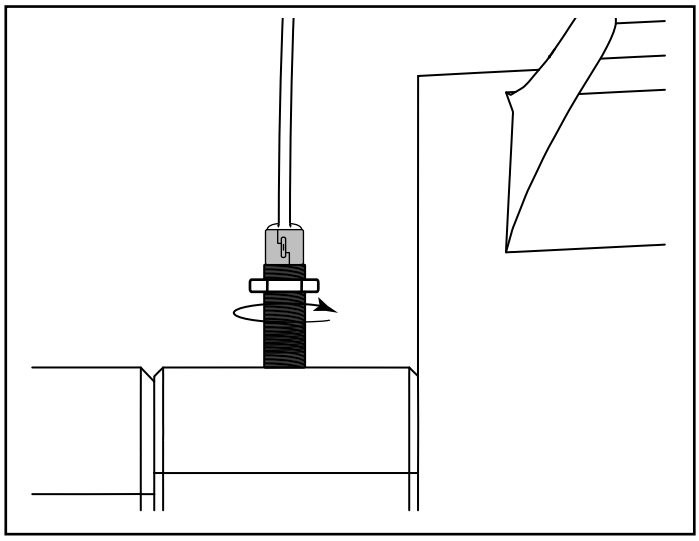

Figure 92 Installing Shaft Position Sensor

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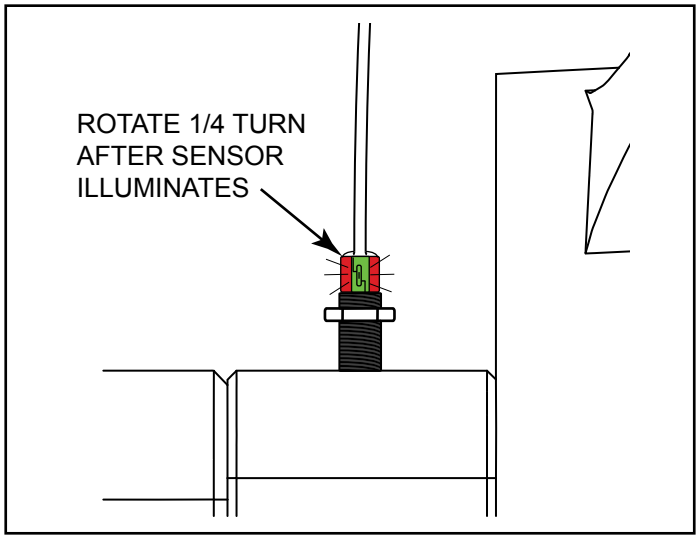

Figure 93 Adjusting Shaft Position Sensor

Optional Shaft Position Sensor Replacement (Cont.)

3. Slowly rotate the sensor clockwise until the sensor becomes illuminated with a green and red light. Once the sensor is illuminated, rotate the sensor a further one quarter (1/4) turn (Figure 93).

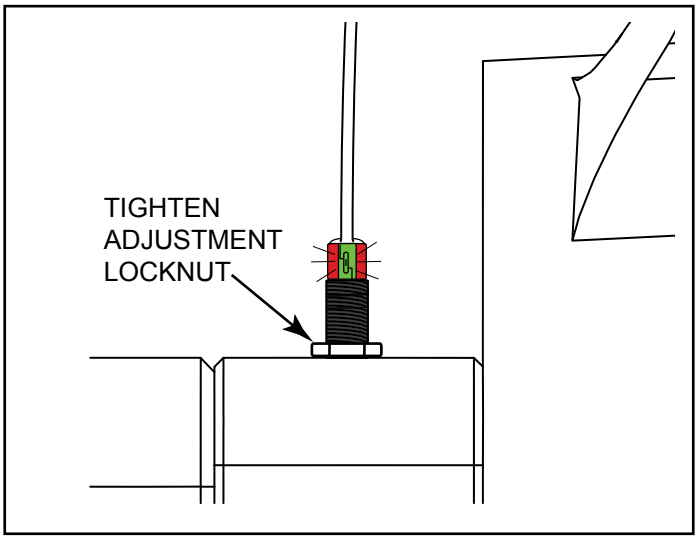

Figure 94 Tightening Adjustment Locknut

4. Tighten the adjustment locknut to prevent sensor movement (Figure 94).

   NOTE: If a false shut down occurs after the adjustment procedure, loosen the adjustment locknut and rotate the sensor a further one-quarter (1/4) turn to ensure no misadjustment has occured.

5. Once the sensor is properly adjusted, disconnect the sensor from the temporary power supply and permanently connect the sensor to the VFD.

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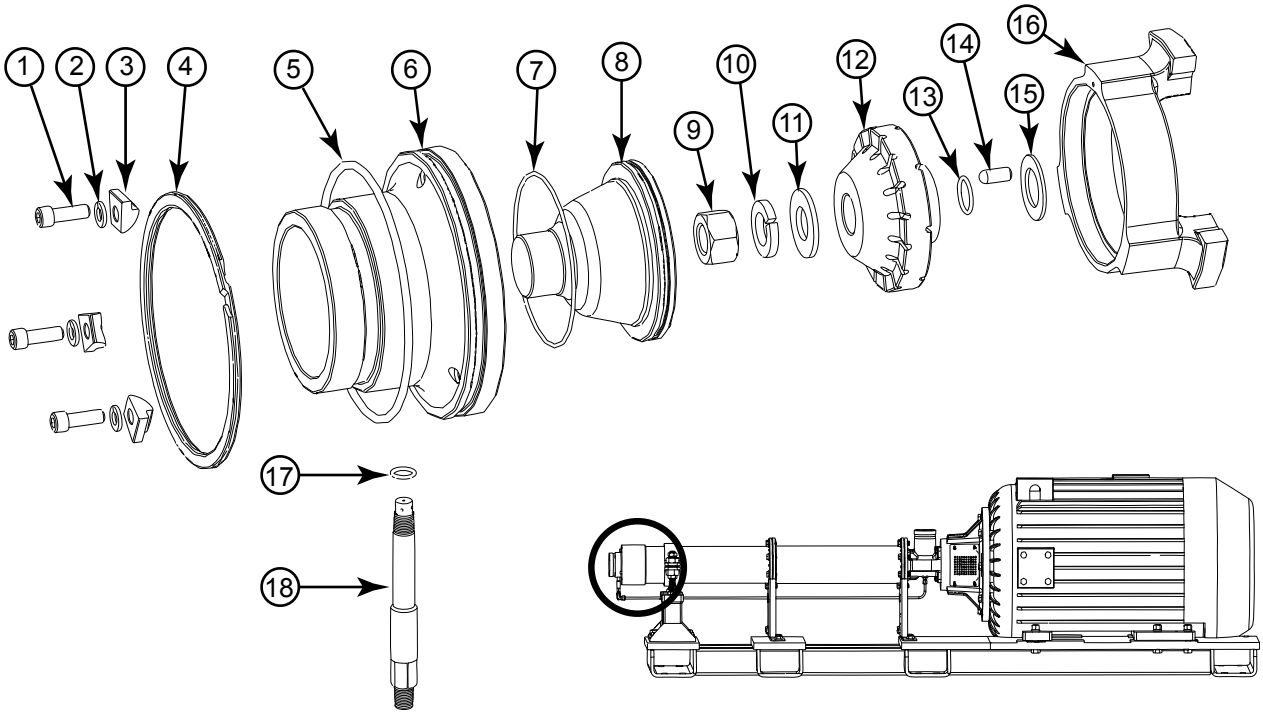
Balance Disc Replacement



Item	Description	Item	Description
1	Cap screw	10	Lock washer
2	Lock washer	11	Washer
3	Retaining clip	12	Balance disc
4	Discharge housing retaining ring	13	Balance disc O-ring
5	Discharge housing O-ring	14	Balance disc key
6	Discharge housing	15	Balance disc washer
7	Cavity cover O-ring	16	Bearing carrier
8	cavity cover	17	Throttle nipple O-ring
9	Pump shaft nut	18	Throttle nipple

Figure 95 Balance Disc Components

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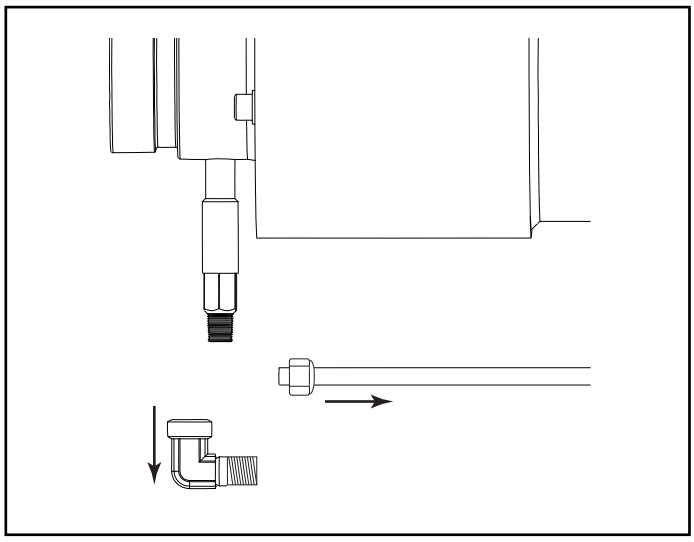

Figure 96 Disconnecting Drain Line

Balance Disc Replacement (cont.)

Balance Disc

ELECTRICAL HAZARD

Make sure to disconnect the power supply to the motor before carrying out component replacement procedures. Follow all Lock out/Tag out procedures developed by your company before starting any maintenance or repair.

Removal

1. Drain the piping and pump.
2. Disconnect the outlet piping.
3. Disconnect the bearing drain line from the throttle nipple (Figure 96).

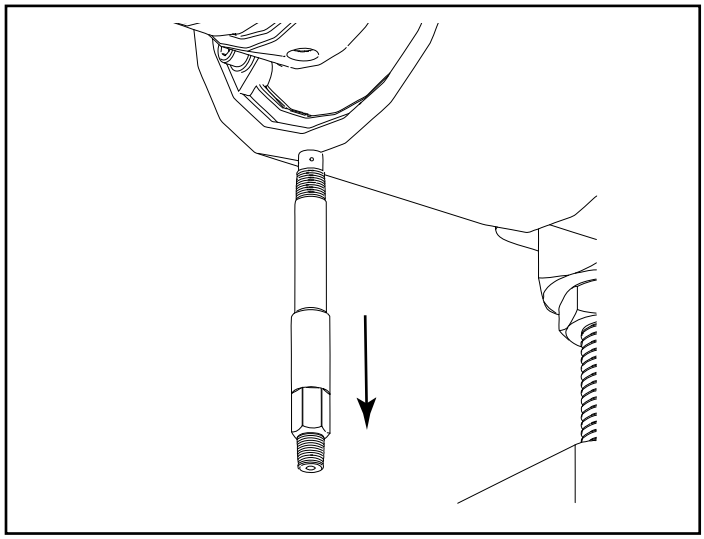

Figure 97 Removing Throttle Nipple

4. Remove the throttle nipple from the discharge housing (Figure 97).

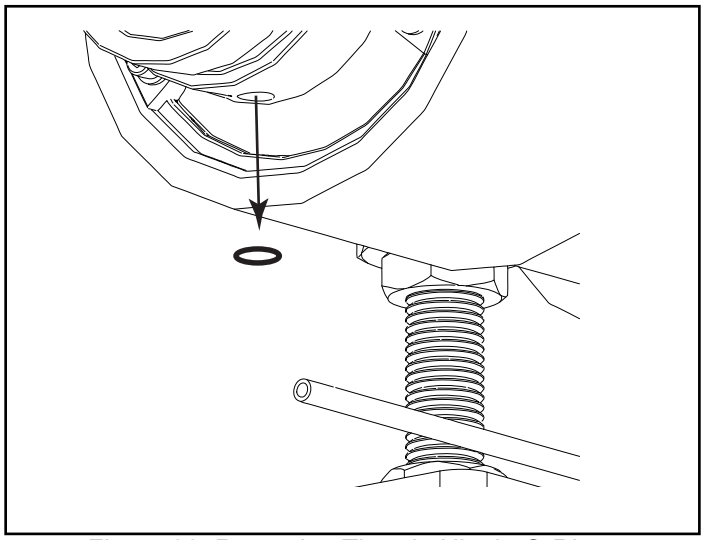

Figure 98 Removing Throttle Nipple O-Ring

5. Remove the throttle nipple O-ring from the discharge housing (Figure 98).

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Balance Disc Replacement (cont.)

6. Remove the three (3) cap screws, lock washers and retention clips from the discharge housing (Figure 99).

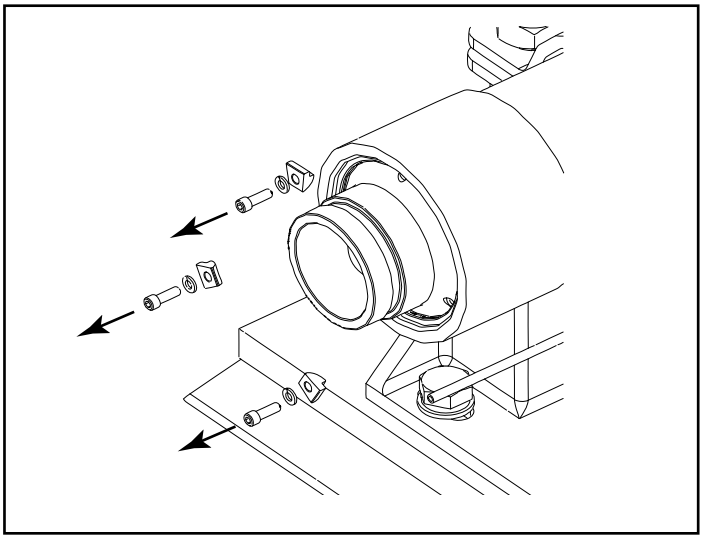

Figure 99 Removing Discharge Housing Cap Screws

7. Remove the discharge housing retaining ring and discharge housing with O-ring from the end shell (Figure 100).

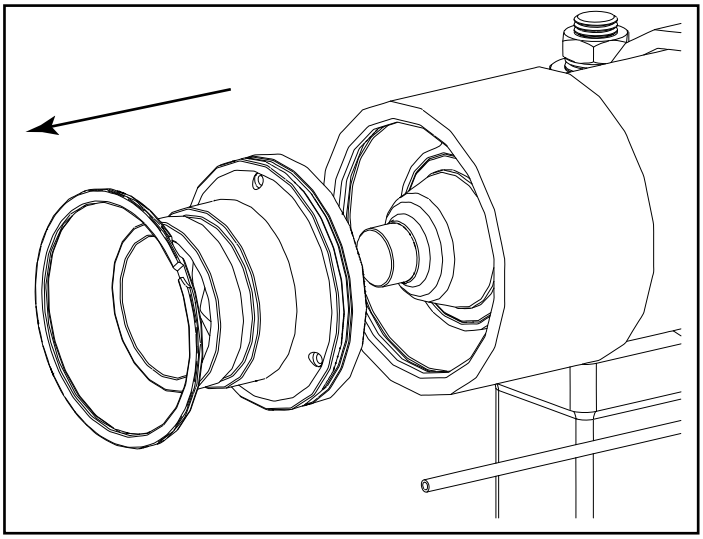

Figure 100 Removing Discharge Housing

8. Remove the cavity cover with O-ring (Figure 101).

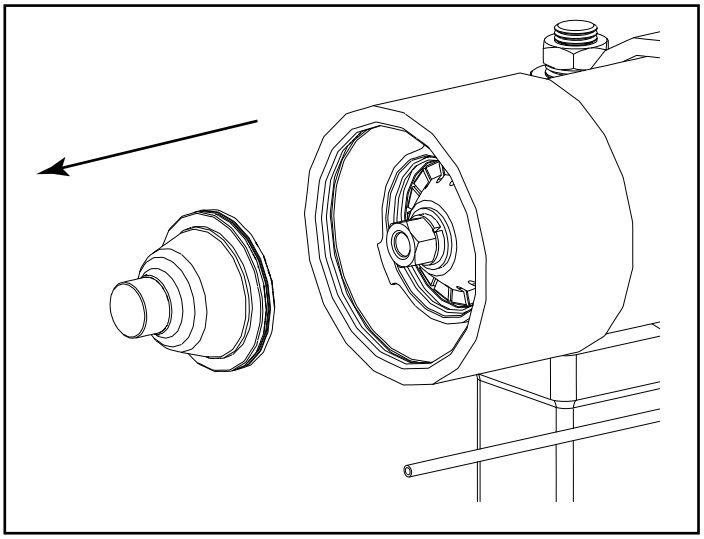

Figure 101 Removing Cavity Cover

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Balance Disc Replacement (cont.)

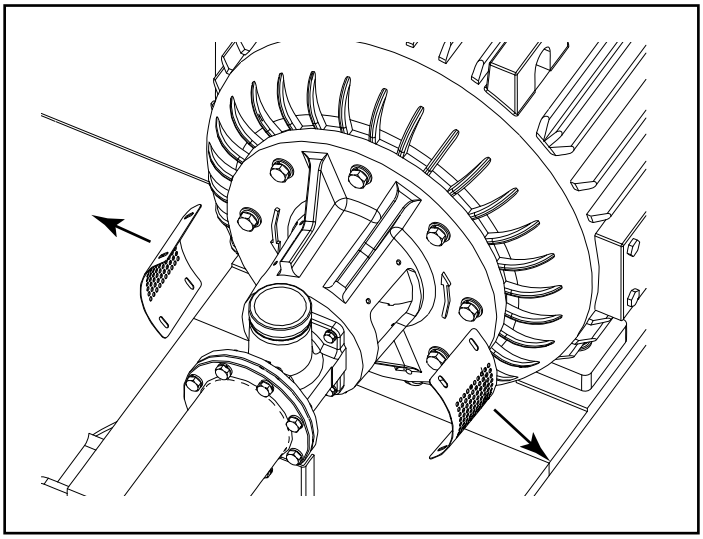

Figure 102 Removing Coupling Guards

9. Loosen the eight (8) screws and remove the coupling guards (Figure 102).

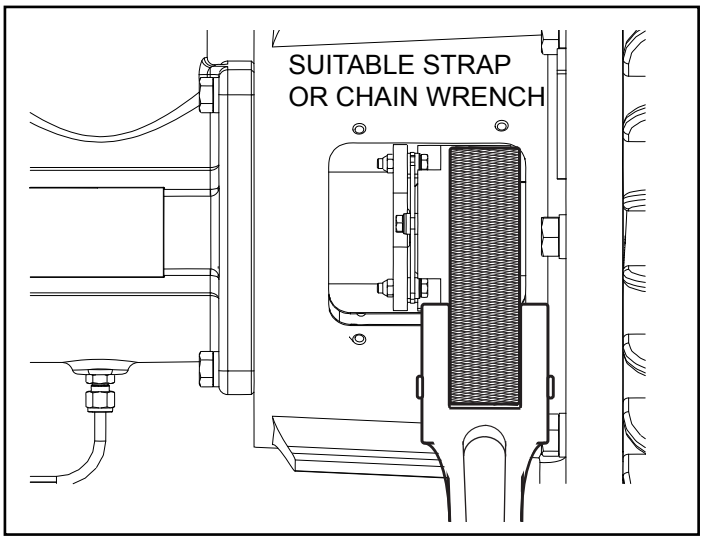

Figure 103 Securing Pump Shaft

10. Lock th flexible coupling in place with a suitable strap or chain wrench to prevent pump shaft rotation (Figure 103).

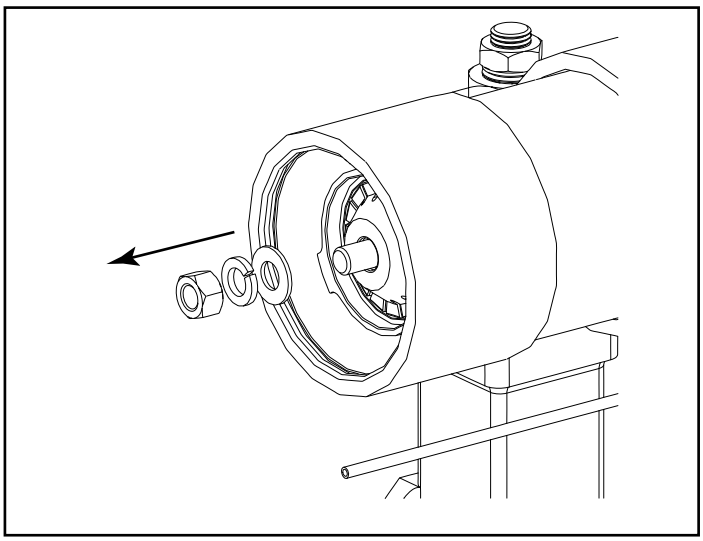

Figure 104 Removing Shaft Nut and Washers

11. Remove the shaft nut, lock washer and washer from the pump shaft (Figure 104).

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Balance Disc Replacement (cont.)

12. Remove the bearing carrier with the balance disc from the end shell (Figure 105).

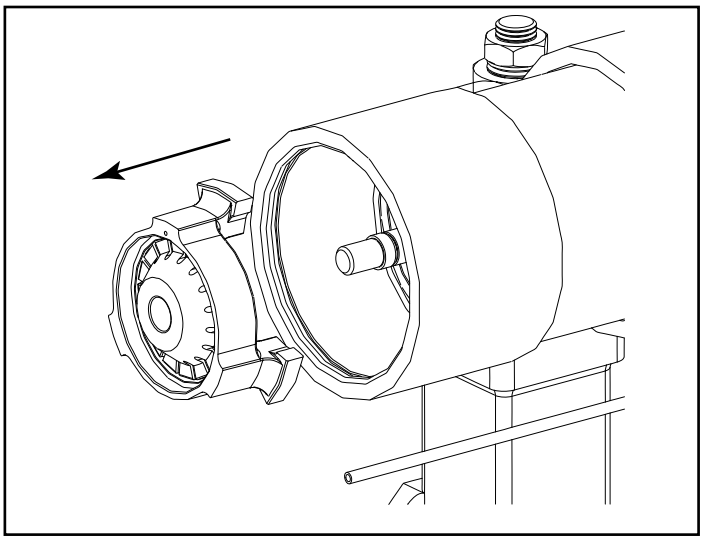

Figure 105 Removing Bearing Carrier and Balance Disc

13. Remove the balance disc key, washer and O-ring from the pump shaft (Figure 106).

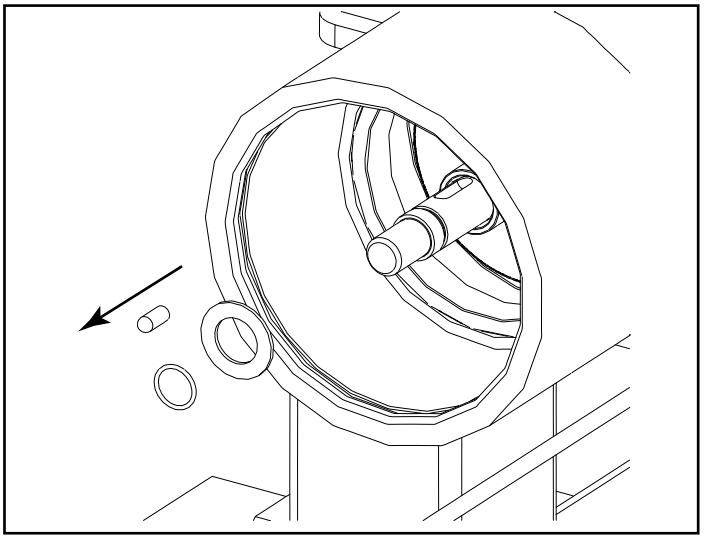

Figure 106 Removing Balance Disc Washer and Key

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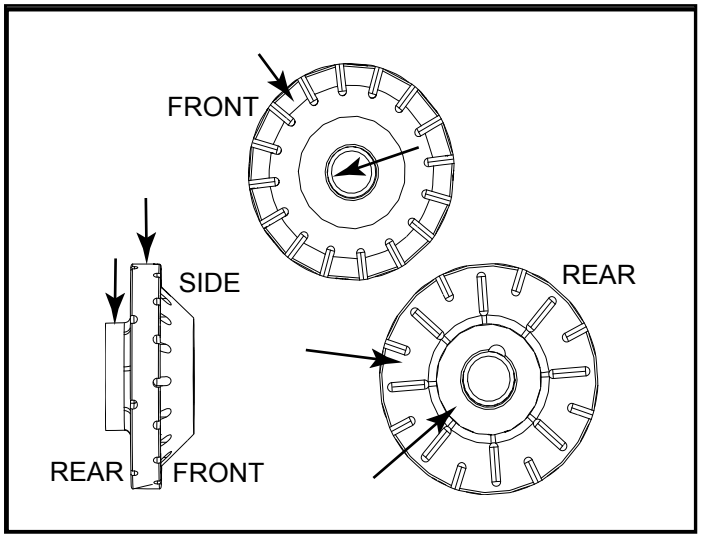

Figure 107 Inspecting Balance Disc

Balance Disc Replacement (cont.)

Balance Disc Inspection

1. Inspect the surfaces of the balance disc for unusual wear. The surfaces may have some wear but should be smooth (Figure 107).

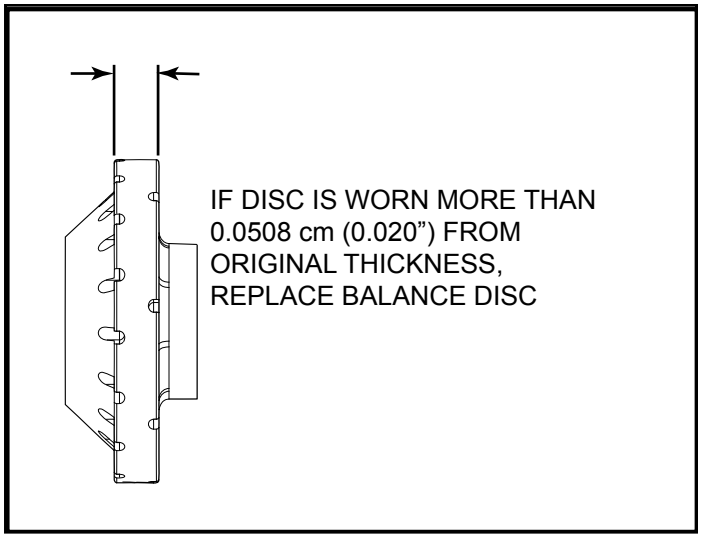

Figure 108 Measuring Balance Disc

2. Measure the balance disc outer hub thickness (Figure 108). Refer to the Balance Disc Wear Chart for wear limit specifications. The maximum acceptable balance disc wear is 0.508 mm (0.020”). If the balance disc wear exceeds its wear limit, it must be replaced.

Balance Disc Wear Chart

Balance Disc Model	Original Thickness When New	Wear Limit - 0.508 mm (0.020")
MSS-15 through MSS-75	13.5 mm (0.53”)	13.0 mm (0.51”)

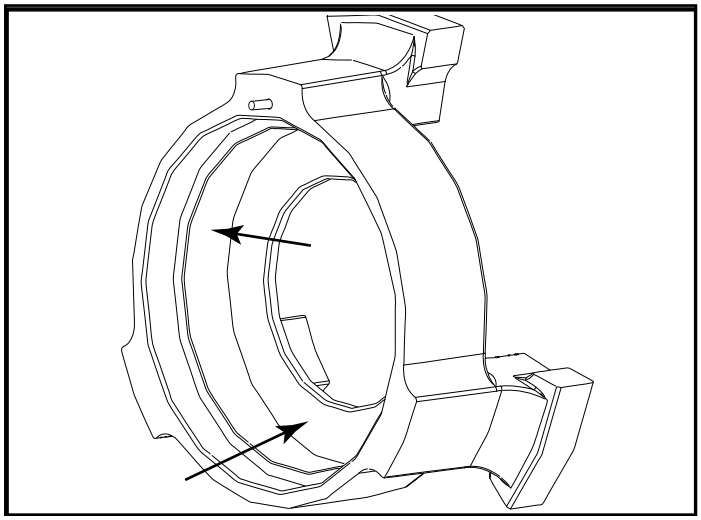

Figure 109 Inspecting Bearing Carrier

3. Inspect the bearing carrier for unusual wear or scoring and replace if necessary (Figure 109).

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Balance Disc Replacement (cont.)

Installation

1. Carefully install the bearing carrier into the end shell (Figure 110).

   NOTE: Grasp pump shaft and lift so that bearing carrier is seated flush against the diffuser housing. Make sure the discharge housing anti-rotation pin is aligned with the top of the pump.

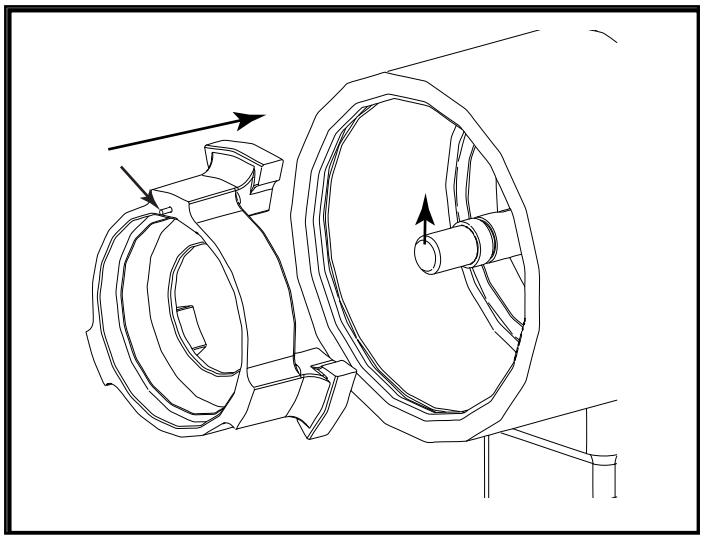

Figure 110 Installing Bearing Carrier

2. Apply system compliant anti-seize compound into the balance disc keyway on the pump shaft, lubricate a new balance disc O-ring and and install the balance disc key, washer and O-ring onto the pump shaft (Figure 111).

   NOTE: Make sure the balance disc keyway is on top and the key is installed with the rounded end facing outward toward the discharge housing.

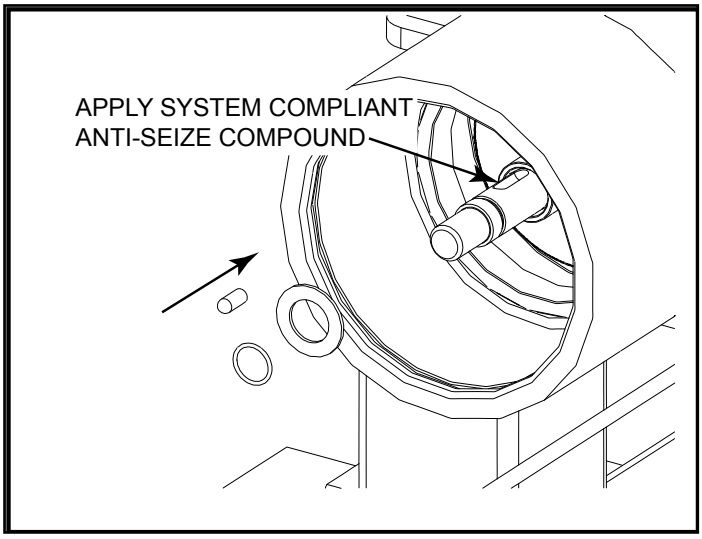

Figure 111 Installing Balance Disc Key, Washer and O-Ring

3. Install the balance disc into bearing carrier (Figure 112).

   NOTE: Make sure the balance disc is firmly seated in the bearing carrier.

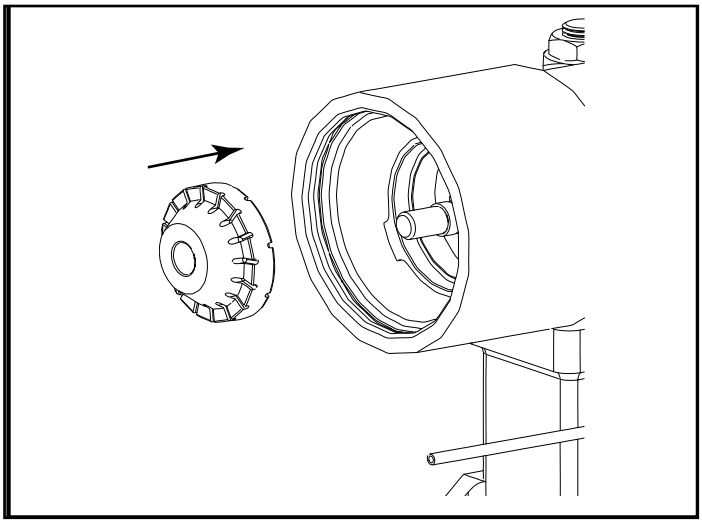

Figure 112 Installing Balance Disc

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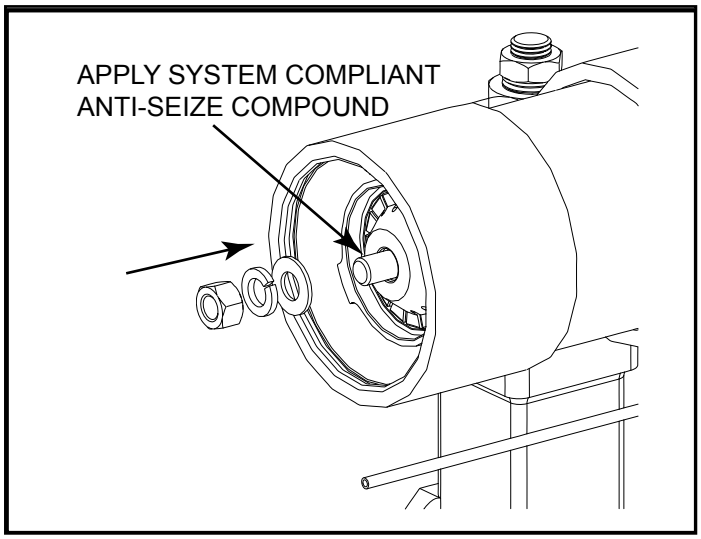

Figure 113 Installing Balance Disc Washers and Nut

Balance Disc Replacement (cont.)

4. Apply system compliant anti-seize compound onto the pump shaft threads and install the balance disc washer, lock washer and shaft nut (Figure 113). Tighten to 68 N-m (50 Lb-ft.)

   NOTE: The pump shaft nut preload is critical to proper balance disc operation. A properly calibrated torque wrench must be used for this step.

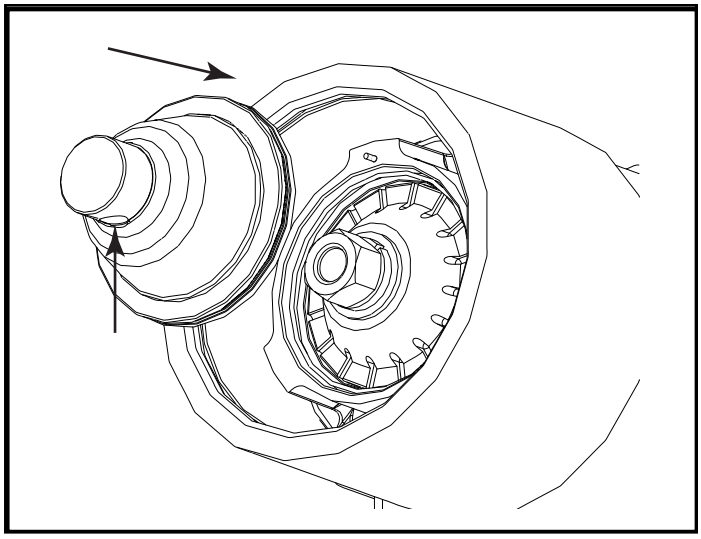

Figure 114 Installing Cavity Cover

5. Lubricate the cavity cover O-ring and install the cavity cover (Figure 114).

   NOTE: Make sure to align throttle nipple opening with the bottom of the pump.

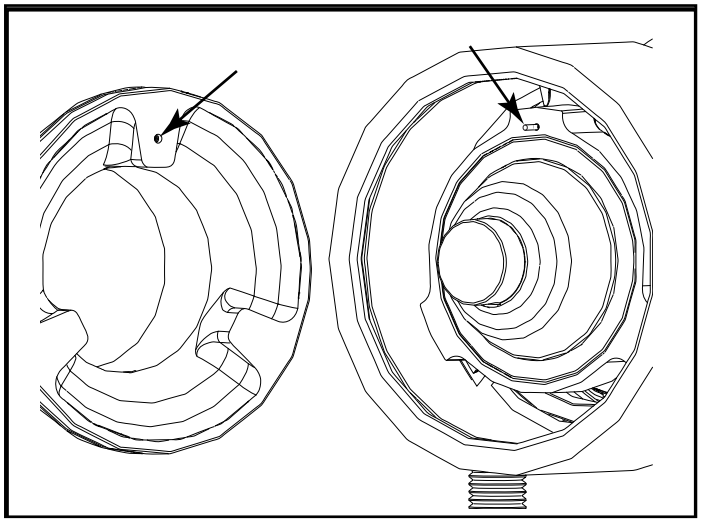

Figure 115 Discharge Housing Alignment Pin

6. Locate the discharge housing anti-rotation pin on the bearing carrier and note the location of the discharge housing anti-rotation cavity (Figure 115).

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Balance Disc Replacement (cont.)

7. Lubricate the discharge housing O-ring and install the discharge housing and retaining ring (Figure 116).

   NOTE: Make sure to align the throttle nipple opening in the discharge housing with the throttle nipple opening in cavity cover.

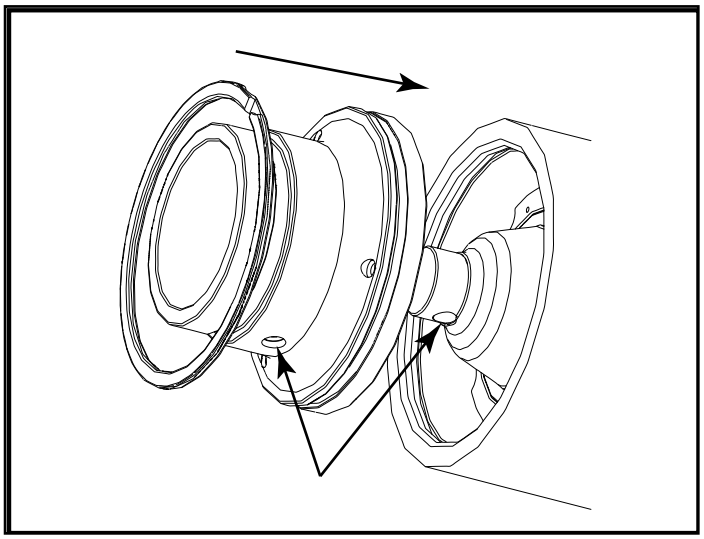

Figure 116 Installing Discharge Housing

8. Temporarily install the throttle nipple to ensure the cavity cover and the discharge housing are properly aligned (Figure 117).

9. Remove the throttle nipple.

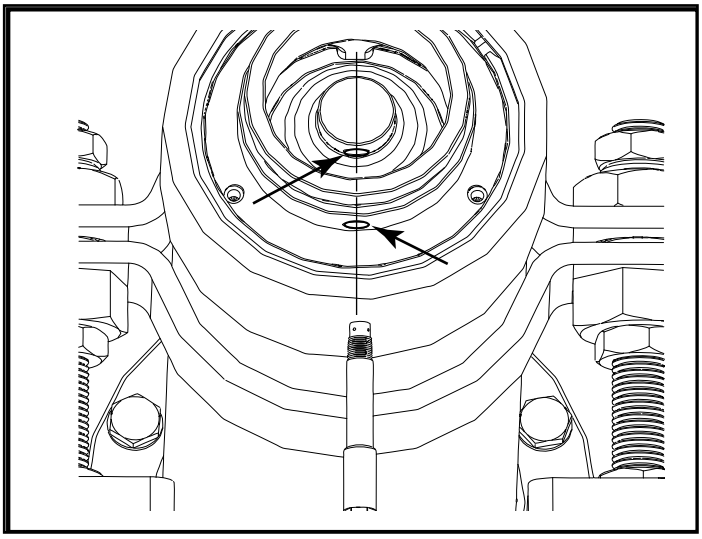

Figure 117 Inspecting Discharge Housing Alignment

10. Install the three (3) retention clips, lock washers and cap screws (Figure 118). Tighten to 8.5 N-m (70 Lb-in)

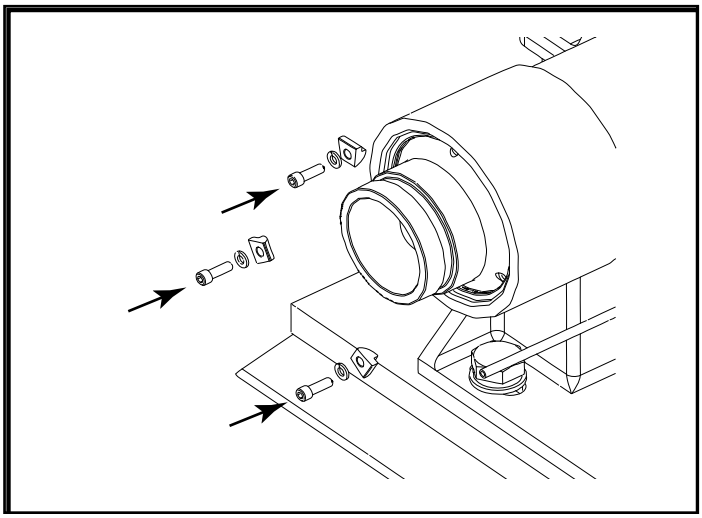

Figure 118 Installing Discharge Housing Retention Clips

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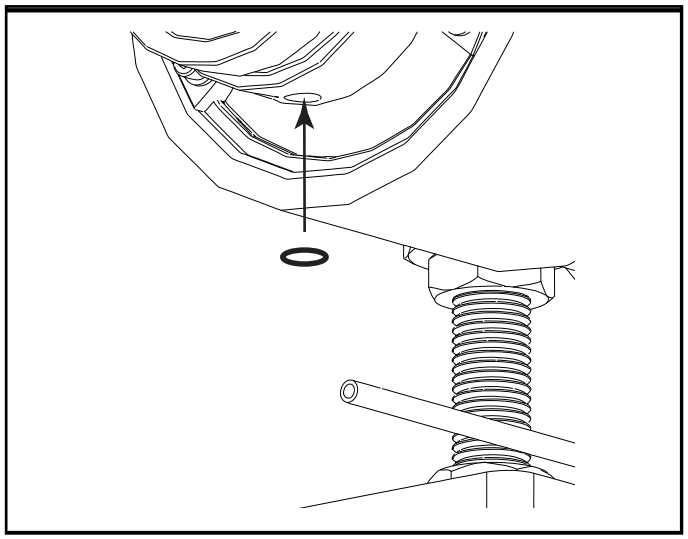

Figure 119 Installing Throttle Nipple O-Ring

Balance Disc Replacement (cont.)

11. Lubricate and install the throttle nipple O-ring into the discharge housing (Figure 119).

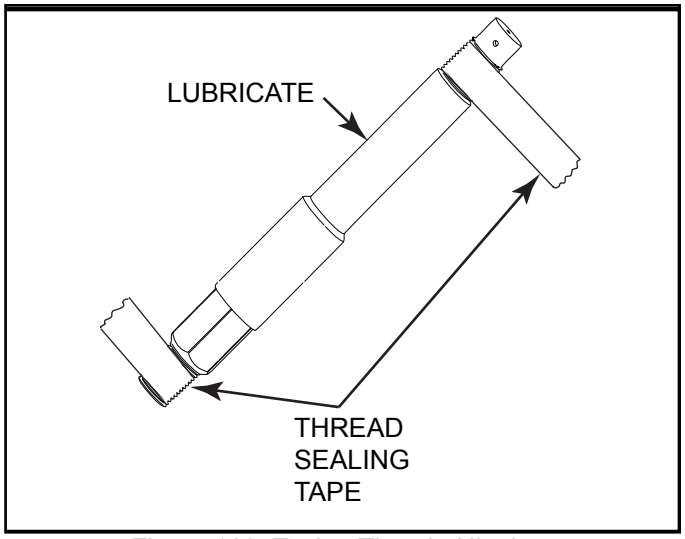

Figure 120 Taping Throttle Nipple

12. Apply thread sealing tape to the throttle nipple threads and lubricate the non-threaded portion of the throttle nipple (Figure 120).

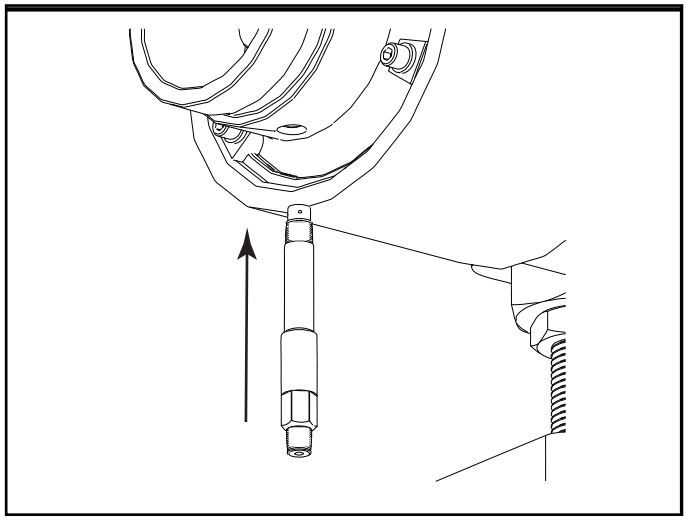

Figure 121 Installing Throttle Nipple

13. Carefully thread the throttle nipple through O-ring and into the cavity cover (Figure 121).

    NOTE: Make sure to twist or thread the throttle nipple through the O-ring to prevent dislodging it.

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Balance Disc Replacement (cont.)

14. Reconnect the bearing drain line to the throttle nipple (Figure 122).

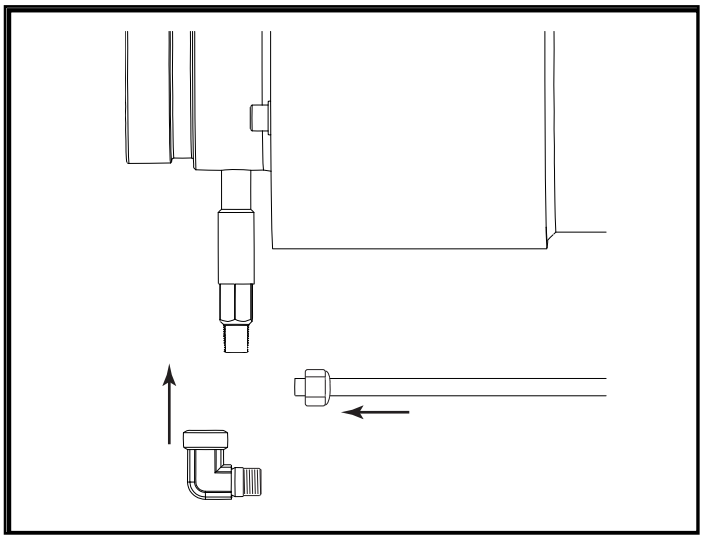

Figure 122 Connecting Drain Line

15. Remove the strap or chain wrench and install the coupling guards and tighten the eight (8) screws (Figure 123).

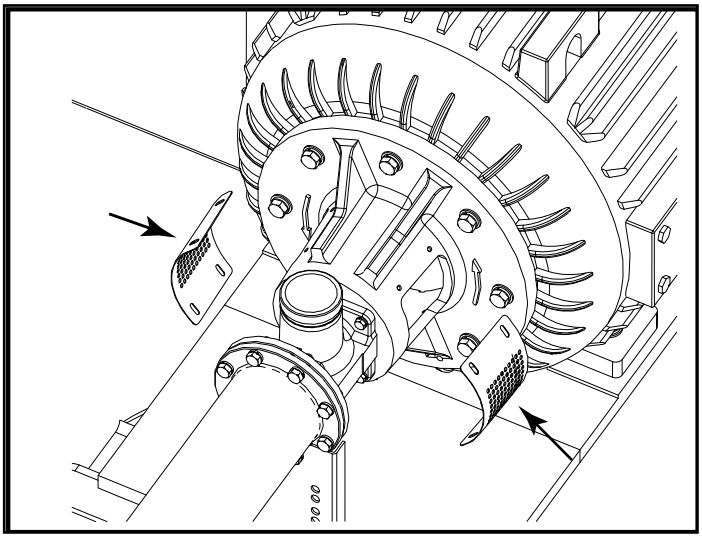

Figure 123 Installing Coupling Guards

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Specifications (cont.)

Components Exploded Views

External Components

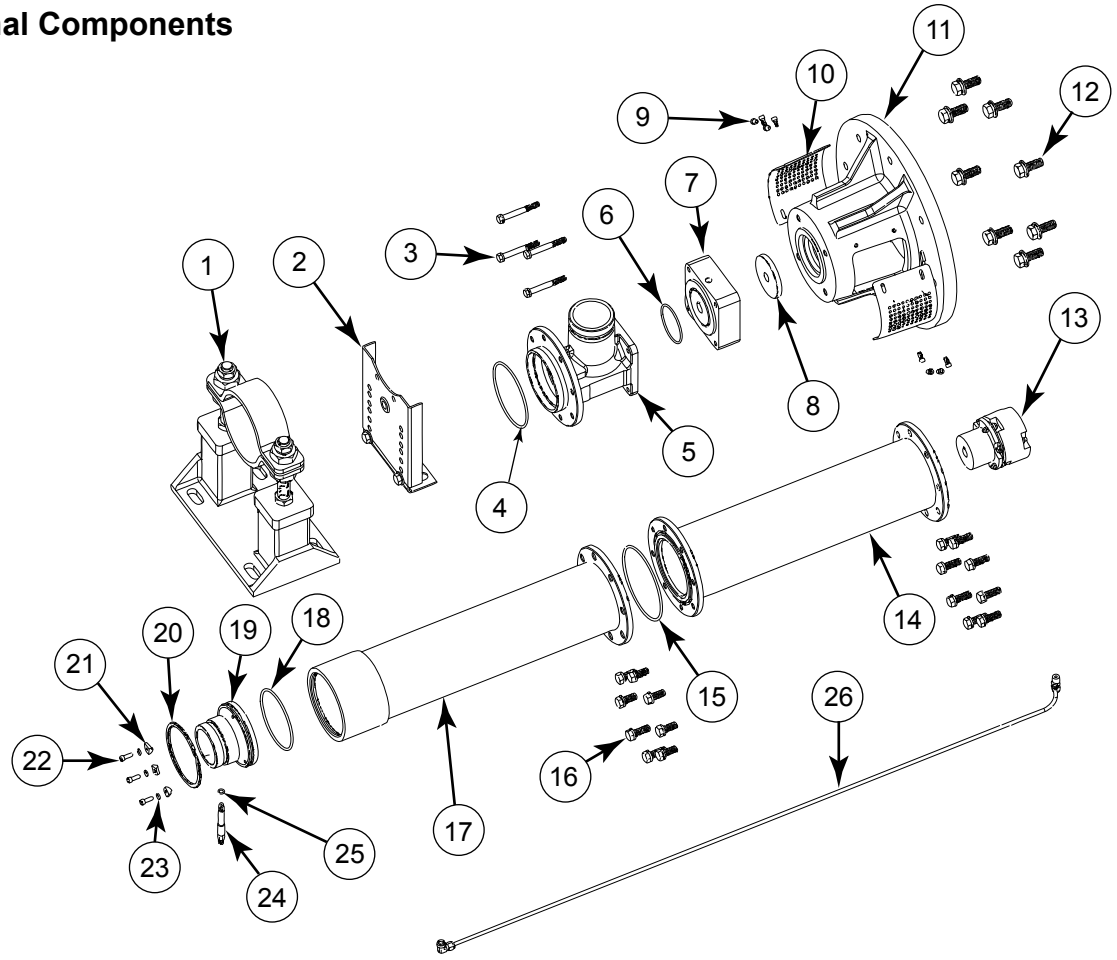

Figure 124 Pump Assembly External Components

Item	Description	Item	Description
1	Precision Leveling Foot	14	Series shell (if equipped)
2	Shell Support Bracket	15	Series shell O-ring
3	Inlet housing bolts	16	Shell flange bolts
4	Inlet housing O-ring	17	End shell
5	Inlet housing	18	Discharge housing O-ring
6	High pressure seal carrier O-ring (if equipped)	19	Discharge housing
7	High pressure seal carrier (if equipped)	20	Discharge housing retaining ring
8	Leakage Bushing	21	Retaining clips
9	Coupling guard screws (part of coupling guard)	22	Retaining clip cap screws
10	Coupling guard	23	Lock washer
11	Motor adapter	24	Throttle nipple
12	Motor adapter bolts	25	Throttle nipple O-ring
13	Flexible coupling	26	Bearing drain line

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Specifications (cont.)

Recommended Spare Parts List

1-3 years of service

A maintenance kit (P/N 8-M0015-MTK) and a retaining ring kit (P/N 8-M0015-RTK) should be kept on hand. The maintenance kit consists of a balance disk, mechanical seal and O-rings. The retaining ring kit consists of all retaining rings in the assembly.

4-5 years of service

A complete disassembly, cleaning and inspection of all pump components is recommended. An overhaul kit and stage kit should be made available before beginning this procedure. Refer to the "Service Parts Kits" chart below for specific pump models.

Service Parts Kits

Part Number	Description
8-M0015-ORK	O-Ring kit
8-M0015-BDK	Balance disc kit
8-M0015-MSK	Mechanical seal kit
8-M0015-TNK	Throttle nipple kit
8-M0015-RTK	Retaining ring kit
8-M0015-ALK	Alignment kit
8-M0015-MTK	Maintenance kit
8-M0015-STK	Stage kit (Model MSS-15)
8-M0020-STK	Stage kit (Model MSS-20)
8-M0030-STK	Stage kit (Model MSS-30)
8-M0040-STK	Stage kit (Model MSS-40)

Part Number	Description
8-M0050-STK	Stage kit (Model MSS-50)
8-M0055-STK	Stage kit (Model MSS-55)
8-M0070-STK	Stage kit (Model MSS-70)
8-M0075-STK	Stage kit (Model MSS-75)
8-M0015-OHK	Overhaul kit (Model MSS-15)
8-M0020-OHK	Overhaul kit (Model MSS-20)
8-M0030-OHK	Overhaul kit (Model MSS-30)
8-M0040-OHK	Overhaul kit (Model MSS-40)
8-M0050-OHK	Overhaul kit (Model MSS-50)
8-M0055-OHK	Overhaul kit (Model MSS-55)
8-M0070-OHK	Overhaul kit (Model MSS-70)
8-M0075-OHK	Overhaul kit (Model MSS-75)

Ordering Parts

ATTN: Field Service Department
FEDCO
800 Ternes Drive
Monroe, MI 48162
USA

Additional Contact Information:
Tel 734-241-3935
Fax 734-241-5173
Web site: www.fedco-usa.com
Choose the "Service and Support" tab

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Specifications (cont.)

Fastener Torque Specifications

Item	Metric	Standard
Precision leveling foot top cradle nuts	149 N-m	110 Lb-ft
Motor adapter bolts - 3/8"	28 N-m	21 Lb-ft
Motor adapter bolts - 1/2"	61 N-m	45 Lb-ft
Support bracket adjustment bolts	61 N-m	45 Lb-ft
Inlet housing bolts	28 N-m	21 Lb-ft
Inlet housing bolts (high pressure seal carrier)	28 N-m	21 Lb-ft
End shell flange bolts MSS-15 through MSS-75	61 N-m	45 Lb-ft
Series shell flange bolts MSS-15 through MSS-75	61 N-m	45 Lb-ft
Discharge housing retaining clip cap screws	8.5 N-m	70 Lb-in
Pump shaft nut MSS-15 through MSS-75	68 N-m	50 Lb-ft

Pump Alignment Specifications

Flange Gap Tolerances for non-uniform gaps		
Good ≥	0.381 mm	0.015"
Acceptable ≥	0.81 mm	0.032"

Balance Disc Specifications

Pump Model	Original Thickness When New	Wear Limit - 0.508 mm (0.020")
MSS-15 through MSS-75	13.5 mm (0.530")	13.0 mm (0.51")

Lubricants and Compounds

Lubricant ASTM D1257	Standard Glycerine or fresh water with soap
Anti-seize compound	Compliant with specific system

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Specifications (cont.)

Maintenance

By following the schedule of preventive maintenance presented below, the MSS pump will deliver years of trouble-free performance.

One (1) day after commissioning

1. Recheck pump alignment (refer to Final Pump Alignment).
2. Visually inspect flexible coupling and tighten the coupling bolts to the specified torque as necessary.
3. Fill out and submit all warranty documentation to FEDCO.

Six (6) months after commissioning

1. Inspect pump alignment (refer to Final Pump Alignment).
2. Inspect flexible coupling: check for wear, irregularities, torsional backlash, running behavior and tightening torque (refer to Flexible Coupling Check).
3. Inspect for leaks, damaged gaskets and condition of all pipe couplings.
4. Wipe pump, motor and baseplate with a clean, damp cloth.

Twelve (12) months after commissioning

1. Inspect pump alignment (refer to Final Pump Alignment).
2. Inspect flexible coupling: check for wear, irregularities, torsional backlash, running behavior and tightening torque (refer to Flexible Coupling Check).
3. Inspect mechanical seal for early signs of leakage or failure.
4. Inspect balance disc (refer to Balance Disc).

4a. Note: If balance disc requires replacement, mechanical seal should also be replaced.

5. Inspect for leaks, damaged gaskets and condition of all pipe couplings.
6. Wipe pump, motor and baseplate with a clean, damp cloth.

Annually

1. Inspect pump alignment (refer to Final Pump Alignment).
2. Inspect flexible coupling: check for wear, irregularities, torsional backlash, running behavior and tightening torque (refer to Flexible Coupling Check).
3. Inspect for leaks, damaged gaskets and condition of all pipe couplings.
4. Inspect balance disc (refer to Balance Disc).

4a. Note: If balance disc requires replacement, mechanical seal should also be replaced.

5. Wipe pump, motor and baseplate with a clean, damp rag.

Five (5) Years

1. Annual maintenance per above.
2. Disassemble fluid end for detailed inspection (refer to Overhaul).

Note: Follow manufacturer's recommendations for motor and VFD maintenance.

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Service Policy

Return Authorization Number (RAN)

Please contact a FEDCO before returning any equipment. You must have a Return Authorization Number (RAN) issued by FEDCO before we can accept any parts. All returned parts must be shipped prepaid to FEDCO with the RAN clearly marked on the package. We need this number to ensure proper handling of the returned parts and supply of new parts, if needed. Repair by FEDCO on equipment that is out-of-warranty will be warranted for three (3) months. Ask FEDCO for details of the repair warranty. Parts will be replaced in accordance with the FEDCO warranty. Use the following address to return parts:

ATTN: Field Service Department
FEDCO
800 Ternes Drive
Monroe, MI 48162
USA

Additional Contact Information:
Tel 734-241-3935
Fax 734-241-5173
Web site: www.fedco-usa.com
Choose the "Service and Support" tab

Procedure

How to Return Parts to FEDCO

1. Provide FEDCO with the following information:
   - Serial number of unit.
   - Description of why parts are being returned.
2. FEDCO will provide a Return Authorization Number.
3. Pack the unit in the original shipping crate or other suitable crate and clearly mark the Return Authorization Number on the outside of the crate.
4. Send unit, freight prepaid, to FEDCO at the above address.

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Service Policy (cont.)

Warranty

Fluid Equipment Development Company, LLC, (FEDCO), warrants its MSS feed pump to be free from defects in design, materials or workmanship for a period of 18 months from shipment or 12 months from the date of installation of the product, whichever occurs first, when said product is operated in accordance with written instructions and is installed properly.

If the MSS pump is altered or repaired without prior approval of FEDCO, all warranties are void. All equipment provided by FEDCO, including pump motors, must be installed on a rigid, steel support structure and base capable of handling full loads during operation. Failure to do so will void warranty. All equipment must be installed such that there are no pipe stresses on FEDCO equipment. Failure to do so will void warranty.

If the MSS pump is not installed and aligned as per FEDCO Installation and Operation Manual, any subsequent damage to the pump and/or motor will be excluded from the warranty.

If any defects or poor performance occur during the warranty period, FEDCO's sole obligation shall be limited to alteration, repair or replacement at FEDCO's expense, F.O.B. factory, of any parts or equipment, which upon return to FEDCO and upon FEDCO's examination prove to be defective. All parts returned for warranty service must be shipped prepaid and include FEDCO's return authorization number.

Equipment and accessories not manufactured by FEDCO are warranted only to the extent of and by the original manufacturer's warranty. FEDCO shall not be liable for damage or wear to equipment caused by abnormal conditions, excessive temperatures, and vibration or caused by corrosives, abrasives or foreign objects.

The foregoing warranty is exclusive and in lieu of all other warranties, whether expressed or implied, including any warranty of merchantability or fitness for any particular purpose. In no event shall FEDCO be liable for liable for consequential or incidental damages.

Declaration of Conformity

This product fulfills the obligations of the applicable EU directives. The declaration of conformity is a standalone document and can be requested, if required, from FEDCO or any FEDCO representative.

Register the product warranty at the time of installation by completing the Warranty Registration Form on the following page and sending it to FEDCO.

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Service Policy (cont.)

Warranty Registration Form

THIS FORM MUST BE COMPLETED AND RETURNED TO FEDCO TO ACTIVATE YOUR WARRANTY COVERAGE.

FEDCO will send confirmation of start of warranty coverage

Please FAX this page to FEDCO to register your warranty.
Retain the original for your future information.

FAX to: +734.241-5173 (USA) or E-MAIL: www.fedco-usa.com and choose the "Service and Support" tab.

Initial Installation

Model #: _____ Serial #: _____

Installation Date: _____ Startup Date:_____

VFD frequency (Hz) if used _____ Voltage and Hz of power supply_____

Feed Flow: _____

Suction Pressure to Pump: _____ Discharge Pressure: _____

Drain flow rate (high inlet pressure option only): _____

Comments:

_____

_____

_____

_____

_____

Installed by: _____

Telephone: _____ Fax: _____

E-mail:_____

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Service Policy (cont.)

Start Up Record

Start Up Check List

1. ☐ Flexible coupling set screws tightened.
2. ☐ Motor adapter guards installed.
3. ☐ All anchor bolts tightened to specifications.
4. ☐ All pipe couplings tightened to specifications.
5. ☐ Motor rotational direction correct.
6. ☐ Motor lubricated to manufacturers specifications.
7. ☐ Final Pump Alignment performed.
8. ☐ Inlet pressure indicator installed.
9. ☐ Inlet pressure switch (if applicable) installed.
10. ☐ Outlet pressure indicator installed.
11. ☐ System pipes are clean and upstream filtration in place.
12. ☐ System leak checked and all air vented from system.
13. ☐ ALL safety devices in place.

Installation and Start-up Information

Start-up Date: _____ Model #: _____
Serial #: _____ Installation Date:_____
Installed By: _____

Operating Conditions

Feed Flow: _____ Suction Pressure to Pump:_____
Discharge Pressure: _____
Drain flow rate (high inlet pressure option only): _____
VFD frequency (Hz) if used _____ Voltage and Hz of power supply_____
VFD Amps: _____VFD Amps (after 48 hours of running time): _____

GENERAL NOTES:

_____

_____

_____

_____

_____

_____

This report has been filled out by: _____Date: _____

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Service Policy (cont.)

Overhaul Record

Overhaul Date: _____

Operating Hours: _____

Reason for Overhaul: _____

_____

_____

Operating Data Prior to Overhaul:
Feed Flow: _____ Suction Pressure to Pump: _____

Discharge Pressure: _____

Operating Data After Overhaul:
Feed Flow: _____ Suction Pressure to Pump: _____

Discharge Pressure: _____

GENERAL NOTES:

_____
_____
_____
_____
_____
_____
_____

Overhauled by: _____

Telephone: _____ Fax: _____

E-mail: _____

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